

# POPULAR SCIENCE

FOUNDED MONTHLY 1872

JANUARY

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35

See Page 31

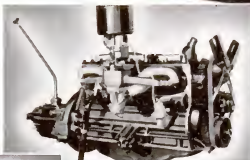
NEW INVENTIONS • MECHANICS • MONEY MAKING IDEAS

HOME WORKSHOP PLANS AND IDEAS FOR DISCOVERY

# Why the 1936 OLDSMOBILE is "THE BIG NEW CAR THAT HAS EVERYTHING!"



Steel "Turret-Top" Bodies by Fisher with No  
Ventilation . . . provide protection of steel  
e, steel below and steel all around; Safety Glass  
throughout is standard equipment in all models.



90 H. P. Six . . . 100 H. P. Eight . . . with  
their new aluminum pistons, vacuum spark  
control and automatic choke these refined  
and advanced engines deliver smoother, livelier  
power with greater all-round economy.

FOR 1936, Oldsmobile offers a big, new  
90 h.p. Six and a luxurious, new 100 h.p.  
Eight . . . both with new Style-Leader Styling  
. . . newly enriched interiors . . .  
smoother, livelier power . . . and all the  
modern fine-car features—some of which  
are shown below. Because Oldsmobile  
gives you *all* that is new and better—with  
nothing slighted and nothing omitted—the  
1936 Oldsmobile is known everywhere as  
"The Big New Car That Has Everything!"



Electro-Hardened Aluminum  
Pistons . . . reduce  
weight of these reciprocating  
parts by 50%; increase  
bearing life 100%; develop  
new smoothness.

Super-Hydraulic Brakes  
. . . self-energizing, always  
equilibrated and completely  
weather-sealed, they assure  
smooth, quick straight-line  
stops at all times.



Ride Stabilizer . . . controls  
sideway and minimizes  
body roll; the spring  
steel bar, connecting rear  
hydraulic shock absorbers,  
keeps car level by a twisting  
reaction if one side  
tends to rise.

Vacuum Spark Control . . .  
and fuel-saver, provides  
automatically the exact  
spark advance for maximum  
gasoline economy; eliminates  
"spark knock."

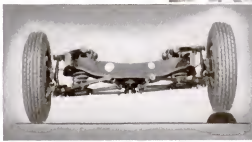


Rifle-Drilled  
Connecting  
Rods . . . carry  
oil to the piston  
pins under pressure.  
Through a special  
spurt hole,  
oil is sprayed on  
the cylinder  
walls as well.



All-Silent Syncro-Mesh Transmission  
. . . with its helical-cut gears, makes  
shifting exceptionally easy and quiet; all  
gears are silent—even low and reverse.

Center-Control Steering . . . applies  
action to front wheels from a point  
midway between; makes steering easy;  
permits no wandering from a set course.



Knee-Action Wheels . . . operate independently of each  
other; "step-over" bumps and holes in the road. Knee-Action  
Wheels permit the use of flexible coil front springs which  
act in harmony with the soft springs at the rear. Combined  
with the Ride Stabilizer, they give a restful, gliding ride.

For Catalog and complete Engineering Information on the 1936 Oldsmobile Six and Eight,

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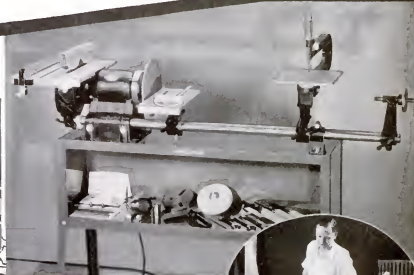
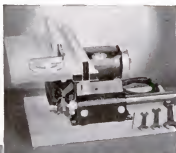
\$665

Starts \$665 and up . . . Eight \$810 and up. All prices at launching,  
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covers built into all cars at the factory at extra cost. Conventional



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## 6 MACHINES IN ONE!

and you can buy them one at a time on the

## GENERAL ELECTRIC STEP-BY-STEP PURCHASE PLAN

★ ★ ★



**(left) SANDING, GRINDING, DRILLING ATTACHMENTS**—with industrial type drill chuck, 9 twist drills, sanding disc, 1/2" grinding arbor and sanding table.



**(right) SCROLL AND SABER SAW UNIT**—with table and complete set of blades—assembled with Circular Saw unit.



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Here's the ideal Christmas gift for man or boy—the sensational new General Electric Workshop—and pennies will pay for it on the G-E Step-by-Step Purchase Plan! You can start a G-E Workshop this Christmas with any of the 6 individual units—the others can be added from time to time to make the entire Workshop that is a marvel of completeness, unmatched in all-round efficiency and practical working features.

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# POPULAR SCIENCE

FOUNDED MONTHLY, 1872

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## THE GIFT OF FRIENDSHIP

**T**HERE is a priceless gift within reach of every one—the gift of friendship.

Of all the services of the telephone there is none more important than this—helping you to make friends and to keep them.

When people are in trouble, you go to them quickly by telephone. The telephone carries your good wishes on birthdays, weddings and anniversaries. Arranges a golf game or gets a fourth for bridge. Invites a business acquaintance to your home for dinner, and advises “home” that he is coming. Congratulates a youngster on his work at school. Thanks a neighbor or asks about the

baby. Renews old times—shares confidences—plans for the future.

Thus the bonds of friendship are formed and strengthened. Greater happiness comes into the widening circle of your life. Some one, somewhere, says sincerely—“It was nice of you to call.” This day, a voice-visit by telephone may bring reassurance to some friend who is wondering how you are.

*More and more are people turning to Long Distance to carry friendly voices across the miles. They like its speed, clarity, intimacy and low cost—especially after 7 P.M., when calls by number to most points cost about 40% less than in the daytime.*



### BELL TELEPHONE SYSTEM

# POPULAR SCIENCE MONTHLY FOR JANUARY, 1936

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*In This Issue—Hundreds of Fascinating Articles Tell the Latest News of Laboratory Discoveries, Scientific Triumphs, and Amazing New Inventions*



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repairing with  
**SMOOTH-ON No. 1**

**T**HIS cement hardens into metallic iron, costs little, is easy to apply and makes dependable permanent and emergency repairs that save the householder big sums.

By following directions in the Smooth-On instruction booklet you can stop steam and water leaks from joints or cracks in the boiler, heater, piping and radiators, stop leaks from gas lines, stop leaks of fumes from air furnaces, ovens and smoke pipes, in every instance avoiding a big labor bill and often the cost of a renewal part.

Smooth-On No. 1 is also excellent for re-setting loose screws, nuts, rivets, hooks, hinges, locks, handles, drawer pulls, casters, etc., anchoring bolts and pipe posts in concrete, plugging holes or seam openings in tanks, troughs and pails, tightening loose bases, etc.

Be prepared for emergencies by sending for the free book and keeping a can of Smooth-On No. 1 in your workshop. Get Smooth-On No. 1 in 7-oz., 1-lb. or 5-lb. can from any hardware store, or if necessary from us direct.



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**Do it with SMOOTH-ON**

**5 ft. Flying Scale Models**  
1/2 size of real planes  
St. Monocoupe (Illustrated)  
St. Stinson Reliant  
St. Heath Parasol  
Build planes that are actually one-third the cost of real ones—perfect for your new Giant Model—each a true outdoor flyer—a \$10 value for only \$1. Everything is in the kit—including all tools.  
H. G. WOODS, AIRPLANE CO.  
554 Southern Boulevard, Dept. 1, New York, N. Y.



## Dear Dad:

I've just found out I can save a wad of money by cutting out my special mixture pipe tobacco. You learn things fast here at college. Please send me an extra \$5 next week.

Affectionately, *Bob*

## Dear Son:

Your logic is bad. You say you're saving money but want more. How come?

*Dad*

## Dear Dad:

I need the five to pay a debt. I bet my roommate that the Dean's pipe mixture cost more than mine. I was judging by its fragrance and mildness. Did my eyes pop when the Dean pulled out a tin of Union Leader! Imagine a tobacco like that for 10¢!

Affectionately, *Bob*

## Dear Son:

I don't have to imagine it; I smoke it. And now that you've taught your nose to appreciate Union Leader's aroma, you can start teaching your own pocketbook how to pay that \$5 you owe.

*Dad*

# UNION LEADER



## THE GREAT AMERICAN SMOKE

© F. Lorillard Co., Inc.

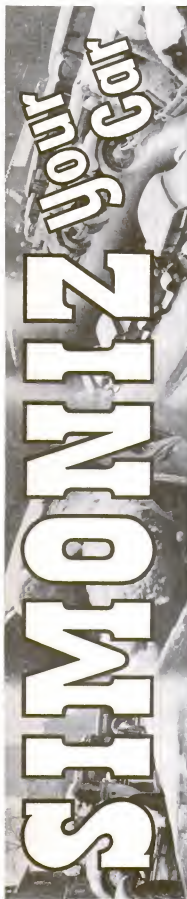
**L**IGHT up a bowlful of Union Leader. Compare it with the most expensive pipe mixture you can buy, beg or borrow. Its mild, old Kentucky Burley tobacco gives you a cooler, mellow smoke... fragrant and friendly.

Then jot down the price of a full

size tin of Union Leader. That's 10¢. Divide that by the 25 or more pipefuls in every package, and you've got the answer why Union Leader is gaining more customers every day than any other smoking tobacco in America. (And Union Leader's great for cigarettes, too!)



Always insist on Simoniz car polish. You can't "Simoniz" your car with anything else. The famous trade-mark SIMONIZ is on each can for your protection.



**Gives the PROTECTION Weather Does Not Wear Off!**



#### WALLS HANG ON SLOTTED STUDDING

Panels of combined asbestos fiber and cement, with holding devices to fit keyhole slots in steel studding, make it possible to install walls or partitions quickly. The studding is set in steel channels at the floor and ceiling



#### COMBINATION DECORATING TOOL

When painting or paper hanging, this handy tool is a timesaver. Beside serving as a painting mask, as above, it functions as a wall-paper trimmer and a straightedge



## HANDY AIDS FOR Home Mechanics



**ADJUSTABLE PLASTER PLUGS.** For driving screws into plaster, these flexible wall plugs can be expanded to fit screws of various sizes



#### STEAMER REMOVES OLD WALL PAPER

An electric heater in the portable apparatus pictured above boils water in the circular pan, and the resulting steam loosens wall paper instantly

**METAL WEATHERBOARD SIDING.** In the photograph at the left, builders are applying a new metal siding to the wall of a garage. When painted, it resembles weatherboard



## Questions

FROM HOME OWNERS

**Q**—how can I tell the difference between flat-grain and edge-grain shingles? Is it practical to use the flat-grain variety anywhere in the construction of a small house?—R. D., Harrisburg, Pa.

**A**—EDGE-GRAIN shingles generally show circular saw marks, flat-grain shingles do not. Edge-grain shingles, of course, form the more durable roof. However, flat-grain shingles, which tend to warp when used on a roof, can be used effectively on the side walls, particularly if they are not exposed directly to the weather.

### Cleaning Mica

**P. F. S., MILWAUKEE, WIS.** When the mica windows in stove doors become clouded and black they can be cleaned by rubbing them with a soft cloth dipped in vinegar. After the vinegar application, wash the windows with clear water and the cloudy coating will disappear immediately.

### Buying a House and Lot

**Q**—WHAT proportion of the total cost of a house should be spent for the lot?—E. S. H., Baltimore, Md.

**A**—IF THE LAND is improved, having street, curbing, sewer, etc., it should not cost more than twenty-five percent of the total. For unimproved property, five percent is considered the maximum.

### Hints on Kalsomining

**G. L. K., LOS ANGELES, CALIF.** Generally, only a single coat of kalsomine is used. Although a skillful painter can "topover," as it is called, with a second thinner coat it is a difficult thing for the amateur to do successfully. If the kalsomine is mixed and applied properly, one coat should be sufficient for ordinary purposes.

### Faulty Concrete Work

**Q**—I RECENTLY poured a concrete wall, and when I removed the forms I found the face of the concrete splotted with clumps of the coarse aggregate (pebbles). What do you suppose caused it? I mixed the concrete thoroughly.—F. W., Dallas, Tex.

**A**—The accumulation of pebbles probably resulted from the use of too much water or the wrong cement-sand-pebbles proportions. When pouring a high wall, it is also good practice to paddle the concrete after it has been poured to prevent the heavy materials from settling to the bottom of the form.

### Cleaning Stone Steps

**T. O. D., RICHMOND, VA.** Grease or oil spots on stone generally can be removed by pouring a hot solution of sal-soda water on the surface and then smearing on a thick paste of fuller's earth and water. Allow the mixture to remain for at least twelve hours and then remove with water. Several applications of the solution may be necessary to clean the stone thoroughly.

### Estimating Varnish Needed

**Q**—CAN you give me a simple rule for figuring the amount of varnish I shall need for a job I have in mind?

**A**—WHEN estimating the amount of varnish needed for a specific job, it is safe to figure one gallon for every 400 square feet of surface.

## YOUR FINANCIAL SECURITY..

**made to MEASURE!**

**Provident Mutual Life Insurance Company**  
of PHILADELPHIA  
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*Policy and interest shall be paid to the beneficiary named in the policy or to the estate of the insured in the event of his death.*

*The right to change the beneficiary shall be reserved to the insured until the death of the insured.*

*The foregoing agreement is made in consideration of the sum of \$100.00 paid by the insured to the company at the time of the execution of this policy.*

*Witness my hand and seal this 10th day of January, 1936.*

*Attest:*

*Secretary*

*Provident Mutual Life Insurance Company of Philadelphia, Pa.*

How much a month must you have when you want to retire?  
How much life insurance should you have for your wife and children?

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Do you know that approximately 25 cents a day can actually get you started on your own monthly income plan?

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LIFE INSURANCE COMPANY OF PHILADELPHIA, PA.



I can save \_\_\_\_\_ cents a day. How much monthly income can I receive starting at age 55, 60, 65 (Check the age) and how much life insurance for my family? My present age is \_\_\_\_\_

Name \_\_\_\_\_  
Address \_\_\_\_\_  
Occupation \_\_\_\_\_

PS 85

# Our Readers Say



## This Unnatural History Gives Him Goose Pimples

THE October issue was swell in every respect but one—that is for me. The thing that bothered me was the picture of the Surinam toad on page 49. The profusion of holes

and emerging toads gave me the "wills." Ever since I was a little shaver I've had the same trouble. I thought some of your readers might be able to give me the reason for this feeling and suggest a method for overcoming it. Whenever I see a similar picture, I have a prickly feeling all over my face, spine, arms, and scalp. This lasts for quite a time and causes me to rub and scratch myself all over. My hair especially bothers me. It feels as though it were on end. I showed several other people the picture and most of them experienced the same sensation. I'd be grateful for a helpful reply on this subject.—J.W.G., Port Richmond, N.Y.



## He'd Take the Mediterranean From Under Rival Navies

WITH most of Europe hot and bothered about naval supremacy in the Mediterranean Sea, now is the time par excellence, it strikes me, to carry out that much discussed project of drying it up! Herman Sorgel, German engineer, sketched out the idea a few years ago (P.S.M., Jul., '33, p. 44). The plan would be to dam the Strait of Gibraltar and drain the Mediterranean into the arid Sahara Desert, turning Europe and Africa into a single continent. Fantastic and absurd? No more so, perhaps, than starting a war to get more territory. This way, there would be plenty of brand-new land for everybody. And it might be too much to hope for—but wouldn't it be great if those rival war boats were left high and dry, with no way to pick a fight with each other!—J.D.C., Trenton, N.J.

## Visions North Magnetic Pole Repelling Rocket to Mars

CONSIDERING all of the experiments that have been carried on with rockets, it's a wonder to me no one has tried magnetism as a driving force. Here's my reasoning. We know that like poles of magnets repel. Now, suppose it were possible to build a giant electromagnet inside of a spherical metal gondola arranged in such a way that the north pole of the magnet pointed down, the south pole up. If this were placed at the earth's magnetic north pole and the magnet energized, wouldn't the north pole of the magnet be repelled by the earth's north pole? According to my calculations, it would take the gondola four and one half minutes to reach Mars.—G.R.B., Flin Flon, Man., Canada.



## Throwing a Little Light On the Subject

I HAVE been looking back through some old issues of the magazine and in the January number of last year there appeared a query from R.L.K. of Denver, Colo., asking why some substances absorb certain rays of light and reflect others. I would like to offer my theory in brief. It is well known that molecules are constantly in motion. The time between the extremes of these oscillations is the frequency or period of vibration to which the frequencies of the different rays of light literally "tune in." The frequency of each color of the spectrum coincides with the period of vibration of one or more molecules of matter. When a light is directed on a substance, the ray or rays which are "in tune" with the frequencies of the molecules constitute the substance are reflected. It is the reflected rays which form the color we are able to perceive.—H.S.B., Snowflake, Ariz.

## Getting to the Point Of the Spinning Shaft

THE difficulty of W.G. Van N., of Jackson, Mich., in regard to the spinning shaft, as he outlined it in the November issue, is due to his confusing the material shaft with the mathematical point at its center of revolution. The rate of motion of a point in a revolving body is  $2\pi r n$ , where  $r$  is the radius and  $n$  is the rate of revolution. When  $r$  equals 0, there is no motion. This can apply only to the dimensionless mathematical point at the center of revolution.  $R$  cannot equal 0 for any material part of the shaft because matter must occupy space. To sum up, the entire shaft is in motion while the abstract point at the center of revolution stands still.—H.M., Buffalo, N.Y.



## Would Convert His Brew Cocks To a New Life

YOUR articles dealing with the utilization of scrap for useful and artistic purposes, I have found, are very helpful. I would like to suggest that, since the repeal of prohibition there are a lot of discarded earthenware jars of six to ten-gallon capacities in many homes, you give us a couple of articles dealing with electroplating. Such a series should be within the compass of the home workshop.—J.G.S., Galveston, Texas.

## These Bottled Light Waves Might Warm Things Up

AFTER deciding to ask this question, I am now afraid that some one will be on my neck for propounding such a problem. Notwithstanding, here it is. If it were possible to have a perfect sphere that was completely silvered on the inside so that no light could

escape and none was absorbed, what would happen if a light was placed in the center of the sphere and allowed to shine under these conditions?—W.H.R., Fort Morgan, Colo.

## Quick, Mr. Walling, Fix Up This Microscope

HAVING no bird bath in our garden I've not been able to get much out of your recent microscope articles. How about a series on fingerprints, fingerprinting, and fingerprint comparison. It should be easy for your ingenious Mr. Walling to work up some system of converting an ordinary microscope into one of those comparison microscopes used by scientific sleuths. We can all make fingerprints, but not everyone has a bird bath.—H.K., Brooklyn, N.Y.



## New Outlet Molding Gives Him Way Out

IN THE past my attention has been called to several helpful items for the household by reading the pages in your magazine which detail each month many of the new products in this field. In November's issue you hit the bullseye for me—a flexible rubber molding containing the necessary wires for setting up additional outlets. Now when the boss of the house decides to rearrange the furniture and lamps (and this is periodical!) I will not have to argue for a week that such a change is impractical because of the location of the outlets and end up by doing a fancy wiring job around door frames, under molding, and, if I can get away with it, under a rug. I can now look forward to furniture-juggling periods more calmly.—M.W.H., Detroit, Mich.

## Quintuplets in Every Home May Save the Day

IN CASE you do not have enough to worry about these days, I would like to give you another little thought for your bag of troubles. Recent forecasts of scientists and actuaries foretell a United States of old people by the year 1980. From their predictions we learn that the age-group between twenty and forty-nine will remain about the same. But the group under twenty will have decreased from a figure of forty-one per 100 of population to twenty-six while the age-group fifty to sixty-nine will have increased from less than thirteen to more than twenty-four per hundred of population in 1980. But that year the number of people of seventy and older will have trebled



in number on the same basis of calculation. To visualize this condition more clearly, consider that these statistics mean each ten people in 1980 will be made up as follows: old people, 3.8; middle aged, 3.2; children, 3—more old people than either of the other groups! This dire prospect is attributed to many causes. Whatever they may be, we are apparently headed towards a population with an older citizenry and one which may decrease in numbers.—W.B.W., Berkeley, Calif.

### He'd Like a Few Snakes With His Reading Diet

I AM a constant reader of POPULAR SCIENCE MONTHLY. For me it is the finest magazine obtainable. Its models, craftswork, ideas, new devices, etc., are too good for words but I would like to see the magazine start a series of articles on reptiles. There are some herpetologists in the country who, I believe, would be glad to furnish such a series. In the November issue there was a notice in which it was stated, "More Marionettes Coming." Why not give me and many others the pleasure of reading, "Series on Snakes Coming?"—L.P., Corona, N.Y.

### Shades of Darwin— The R. H.'s Are at It Again

I AM one of those individuals who would not miss a good argument—either by conversation or correspondence. I wish to take issue with R.H., of South Sutton, Mass., who disagrees in the November issue with my letter in the September magazine answering another antievolutionist. In the first place I didn't say that my main reason for being an ardent evolutionist was the constant changing of radioactive elements. That would be absurd. I realize, as every one else does who uses his head for something besides a hat-rack, that heredity cannot take place in inorganic substances. An organism must have the power of reproduction in order to pass on its characteristics and to evolve a new species. Scientists, of the caliber of Luther Burbank, have created new species of both plants and animals by cross-breeding. Scientists can and do trace the origin of the horse by a series of unbroken steps (no missing links here) to an animal the size of a fox terrier. The present horse is as far removed in size and appearance from this ancestor as Ghandi is from a tuxedo. As far as the origin of humans from the simians is concerned, I can make this statement: No living tribes of men show such a wide divergence in skull forms as that existing in the skulls, bones, and fossils that have been unearthed.—R.H., Edgewood, Pa.

### Finds Inner-Tube Marionettes Much to Her Liking

A RECENT issue of your magazine proved to be of special interest to me for I found Mrs. Drake's article, "Practical Marionettes Made From Old Inner Tubes," to be very satisfactory. By following the detailed instructions, a delightful reward awaits one—a toy which is inexpensive and practical. And the figures can be made with few tools and a woman's small mechanical ability. I hope to see more articles by her in future issues.—(Miss) M.S.L., Monrovia, Calif.



### Here's How To Enlarge Pictures and Balloons

WRITE one stone in my hand and wishing to kill the proverbial two birds, I answer two problems presented in the November issue. P.B.M., Marionville, Mo., wants to get around the expense of an enlarger for amateur use only. Probably many of the photo fans have run into this same problem. I managed it in this way: A camera is the essential part. It need not be modern in design nor possess a particularly fast lens. Mine is an old five-by-seven Premo. It had only a short bellows but an extension back was easy to make. All the other necessary parts—lamp house, rack, and negative carrier—are of very simple construction. The most difficult to make is the negative carrier. This must slide easily, provide facilities for masking, and must hold the negative absolutely flat. The rapid rectilinear lens I use cost me fifty cents. It is made to cover a four by five plate but, at the bellows extension used in enlarging, it covers perfectly well. P.K., of Omaha, Neb., has difficulty in floating his hydrogen balloons. There are several things which might cause this. Hydrogen has the smallest molecules of any gas, making it hard for ordinary rubber to hold it. Probably by the time he had collected a sufficient quantity of the gas, a correspondingly large amount has seeped through the rubber. Then again, hydrogen emerging from a generator is usually impure. The experimenter might profit by inflating his balloons with hydrogen after he had passed the gas over calcium chloride.—J.W.N., Needham, Mass.

### A Rousing Cheer For the Flat Mailing of P.S.M.'s

FOR some time I have been wanting to write to magazine publishers about an annoyance but you have got ahead of me by remedying this condition in the case of your magazine. It is just this. You have put in to effect that commendable institution of mailing your magazine to subscribers flat—not rolled up but flat, I repeat. This is a splendid innovation for I know of nothing that is more deterring to a cross-country reader to try to read a magazine, the pages of which have to be pushed back continuously. Besides, rolling a magazine ruins it for anyone who wants to keep it filed with other issues for future reference. I also want to thank you for the article in a recent issue (October) giving plans for a hand loom. Any one with a good set of tools and the knowledge of how to use them should have no trouble in building the loom. Perhaps we can find another article by Mr. Gottlieb on how to use the loom and some notes on the art of weaving.—G.P.J., Milwaukee, Wis.

### Norway, Says Reader, Has a Burden of Beasts

L.K. of Topeka, Kans., called our attention in the September issue to the interesting fact that Australia has no native animal which can be used as a beast of burden. Australia as a continent may be unique in this respect but think of Norway's predicament if she had to depend on native animals for her beasts of burden. The only native animal of Norway is the lemming—a small, yellowish-brown, furry rodent. This animal is of no value to the country. In fact, it is a detriment. When the lemmings go on their strange, periodic migrations, they swarm in countless numbers down mountain sides, through villages, across rivers, and finally the survivors reach the ocean where they continue onward

and swim to their death. As these hordes move across the countryside, they destroy crops, stored grains, and foodstuffs. Norway, I should say, got a raw deal when the animals were distributed on this planet.—O.R., Minneapolis, Minn.

### A Little Smoke on Saw Saves A Lot of Strain on Eyes

AS an aid to home mechanics, I would like to offer a suggestion. If you have ever tried to sharpen a handsaw under an artificial light, you know what a strain it is on your eyes. The next time you have to do it, try smoking the teeth of the saw over a lighted candle and discover what a difference it makes in your sharpening job. You will be able to set and sharper each tooth and there will be little or no strain on your eyes.—P.E., Matawan, N.J.



### Wants the World To Use The Same Yardstick

ON the "Here's the Answer" page of last month's issue, J.C., of the S.S. *Marla Perinovic*, raised the question of the difference between a billion in the United Kingdom and in the United States. He might have broadened his query to include such common measures as the quart, gallon, bushel, and even the inch. For there are differences in all these units of measure as established by each country. For example, the British liquid gallon is equivalent to 1.20094 U.S. liquid gallons. The British and U.S. liquid quart, of course, vary in the same proportion. In this British gallon, there are 277.42 British cubic inches but in U.S. inches there are 277.418 cubic inches. The U.S. bushel is equivalent to .96895 British Imperial bushel. All these differences are arbitrary. The British gallon, for instance, was determined by an act of Parliament which fixed the gallon as the volume of ten pounds of distilled water weighed in air against brass weights, the air and water to be at 62 degrees F. with the barometer standing at thirty inches. A meter is equivalent to 39.370113 British inches whereas in our system, it is equal to 39.37 inches. This difference in reckoning the inch equivalents accounts for the difference in computing the cubic inch capacities of the British and U.S. gallon. In the near future, let up hope, that a universal system of weights and measures, founded on a scientific and sensible basis, will be adopted.—B.C., Milwaukee, Wis.

### When Too Many Pictures Spoil the Best of Films

INVENTORS frequently, it seems to me, overlook the simple but much needed improvement in their respective fields. What I have in mind at the moment is a camera with which it is impossible to take double exposures. It should not be difficult or expensive to incorporate such a refinement in the present-day camera. Some device which blocks the shutter release until the film roll has been turned or, better still, a film roll that automatically turns itself after each exposure would do the trick. I think that the readers of your magazine should be a promising group to which I might address such a thought. At least, I hope so.—A.T.P., Lima, Ohio.

HOW ABOUT ONE THAT TAKES THE PICTURE, DEVELOPS AND PRINTS IT AND MOVES IT IN A SELF-OPENING ALBUM?



# FINDING THE FACTS FOR FORD



THIS is the Ford electrical experimental laboratory at Dearborn, Michigan. Here scientific apparatus discloses facts which Ford engineers insist on knowing. Here production standards are set up—materials tested—specifications written.

Much special equipment has been designed and built by Ford for specific purposes such as the machine which tests distributor governors and distributor vacuum brakes. It duplicates all conditions of speed and load which affect these units in actual operation.

Distributor rotors are subjected to high-tension current from a 30,000-volt transformer to determine their dielectric strength. Ignition points are life-tested on a machine that



operates 24 hours a day. This helps Ford engineers to work out best designs and select best material for every part.

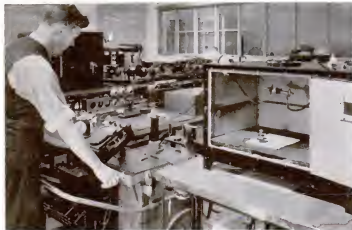
Steps are always being made to reduce service costs for Ford owners. The distributor breaker-plate and point assembly is now included in the Ford factory-exchange items. It includes the plate, spring and the two sets of ignition points. The exchange price for this factory-reconditioned unit is low.



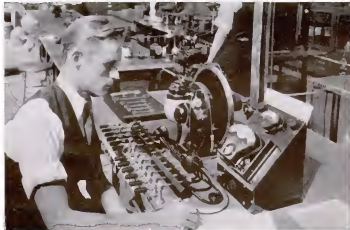
*Distributor breaker-plate and point assembly is now included in factory-exchange plan.*

Regardless of where it functions, the most serviceable and the most economical part for a Ford car or truck is one which meets Ford requirements. That's why it always pays to insist on Genuine Ford Parts—they always measure up.

## FORD MOTOR COMPANY—DEARBORN, MICHIGAN



*Electric oven with automatic temperature control where distributor rotors receive high-voltage test.*



*This specially designed equipment tests ignition units under conditions encountered in actual service.*





RAYMOND J. BROWN, Editor

## Meet the Champion Inventors

**T**HE country's greatest inventors don't know how many inventions they have made.

A man of whom you probably have never heard is the champion U. S. patentee.

These are two of the curious facts that have just come to light in a survey inspired by the question:

*"Who are the most prolific living in-*

**By AUBREY D. McFADYEN**

*ventors to be found in America today?"*

In other words, who are the living contenders for the all-time mark set by Edison, greatest of all inventors, who at the time of his death had to his credit the amazing total of 1,099 patents?

When the editor of POPULAR SCIENCE MONTHLY proposed this question to me,

### LEADING PATENTEES

|                           |     |
|---------------------------|-----|
| John F. O'Connor . . . .  | 949 |
| Elihu Thomson . . . . .   | 696 |
| Carleton Ellis . . . . .  | 648 |
| Henry A. Wise Wood . . .  | 434 |
| John Hays Hammond, Jr. .  | 360 |
| Clyde C. Farmer . . . . . | 344 |
| Ethan I. Dodds . . . . .  | 321 |
| Edward Weston . . . . .   | 309 |

Dr. Elihu Thomson, below, is often called the dean of American inventors. He is here shown with his first model of the arc welder



Here is the most prolific living American inventor, John F. O'Connor, of Chicago, Ill. Most of his 949 patents concern railway draft gearing

a few months ago, it seemed as though it would be not only an interesting one but also an easy one to answer. Names of a number of outstanding contributors to human welfare came readily to mind—men whose inventions are responsible for many of the conveniences of modern living, and whose discoveries have shaped and are still shaping the course of industry. Wouldn't it be a simple matter to canvass them, and ask each one how many inventions he had made?

It turned out that most of them didn't know! Only a few of the leading inventors had kept a careful check of the number of their patents. Some were at a loss even to give an estimate. Others guessed too high or too low. Another drawback to this method of settling the question was the fear—which later proved to be well founded—of overlooking entirely some

HE DOES  
HIS INVENTING  
IN THE  
LABORATORY



Carleton Ellis, whose discoveries in chemistry have earned him 648 patents. A boyhood interest in amateur photography started Ellis on his career. He is now working in the important new field of synthetic resins

comparatively unknown inventor, who might have managed to evade the limelight while producing as many inventions as more prominent men.

So a different method of approach, more difficult but far more conclusive, was chosen. Under my direction, expert professional searchers dug into the voluminous records of the U. S. Patent Office at Washington, D. C. Whenever they encountered a name that recurred frequently in the periodical lists of patentees, they checked every patent ever issued to this man, following back his trail of inventions as far as necessary—in some cases, through forty-five years of records! The results of this exhaustive survey were a complete surprise to every one concerned in it.

Here are the eight men who head all living American inventors, with the number of patents each has obtained, as revealed by Patent Office records: John F. O'Connor, 949; Elihu Thomson, 696; Carleton Ellis, 648; Henry A. Wise Wood, 434; John Hays Hammond, Jr., 360; Clyde C. Farmer, 344; Ethan I. Dodds, 321; Edward Weston, 309.

How many can you identify? Perhaps you have already recognized one or two familiar names on the list—possibly more. But a surprising number of the members of this royal family of inventors are unknown to the average man. Look at the name at the top of the list. Here is an inventor with nearly a thousand patents to his credit and I would be willing to wager that you have never heard of him.

Who is John F. O'Connor? His name is not to be found in "Who's Who" or other standard biographical works of reference. To those outside his own profession of railroading, he is comparatively unknown. The reason is that most people have no occasion, in their everyday lives, to concern themselves with draft gearing—and that is his specialty.

Railroad men are well acquainted both with draft gearing and with O'Connor. For draft gearing is the inconspicuous but highly important cushioning mechanism in the couplers of railway cars. It acts as a shock

absorber when cars bump together, and it provides slack so that an engine starting off with a train can pick up the burden of one car at a time—else a long train could not be set in motion. And nearly all of O'Connor's inventions relate to draft gearing.

What a contrast between an inventor like Edison and one like O'Connor! The first, perhaps, typifies the popular conception of an inventor—a dabbler in many fields, experimenting with anything and everything. And here is O'Connor, on the other hand, who has concentrated virtually all of his efforts upon the task of perfecting one single

bit of mechanism. His unusual career should be worth looking into.

Going back a few years, we find an ambitious boy who has come to this country from his native Ireland, and has obtained his first job at the age of fifteen. He works during the day; attends night school; and, designated simply as "M. E. 2269," he is taking correspondence courses—something new in those days—in mechanics and electricity.

Time passes, and the lessons bear fruit. The one-time machinist's helper has become general foreman of roundhouse and shops at Providence, R. I., for the New York, New Haven and Hartford Railroad. His ability wins recognition; "Ten new loco's," reads a memorandum, "construction to be supervised by O'Connor." He invents snowplows, wrecking equipment, shop devices, and sees them generally adopted for railway use.

Full opportunity for his inventive talents comes at last when he becomes asso-

ciated, as consulting engineer, with a Chicago manufacturer of draft gearing. One of his first acts is to construct a testing device that bangs two cars together with a measured force. It records automatically the entire action of the draft gearing in dissipating the terrific shocks—reaching forces well over 500,000 pounds—received in actual service. With such fact-finding tools to aid him, O'Connor has developed his extraordinary productivity of inventions. Rarely has he had less than 100 patent applications pending at once, up to the time of his retirement four years ago. That, briefly, is the story of the champion inventor that nobody knows.

**B**ECAUSE the 696 inventions of Dr. Elihu Thomson—the second most prolific inventor—happen to include a number of spectacular ones, he fares rather better in the public eye. The modern arc lamp that lights city streets is one of his creations. Electric welding is another. He laid the basis for successful alternating-current motors, and developed the first high-frequency dynamos and transformers, as well as the little watt-hour meter that determines your monthly electric bill. The General Electric Company was founded upon his patents. At eighty-two, he is still busy inventing; an improvement in electric refrigerators is his latest achievement. Virtually all of his inventions are in the electrical field. There is one notable exception, for which an accident was responsible—his invention of the centrifugal cream separator.

The story is told that Dr. Thomson was lecturing to a class upon the effects of centrifugal force, as applied in dryers and in steam-engine governors. Grasping a bottle of liquid, he whirled it about to illustrate his point. There chanced to be some sediment in the bottle, and his observant eye noticed that it settled toward the outside of the vessel. Evidently the same principle could be applied to separate liquids of different density and the centrifugal cream separator, now in commercial use everywhere, was the result.

Is the jack-of-all-trades inventor giving way to the inventive specialist? One might think so, to look at the examples of these two men. Let us try another.



Henry A. Wise Wood, the economist and poet whose discoveries have doubled the speed of newspaper presses. One of his most important ideas was conceived on a train and jotted down on the small scrap of newspaper reproduced above. Wood holds a total of 434 patents

# Motorless Planes

PERFORM AMAZING  
NEW FEATS



Hawley Bowlus and Richard du Pont (at rear) in a novel two-passenger craft

*Riding the Air Currents in  
Modern Gliders, Dare-Devil  
Sportsmen All Over the World  
Are Blazing New Sky Trails*

By  
**EDWIN  
TEALE**

A streamline glider  
being prepared for  
use in a sky-train.  
The cabin is com-  
pletely inclosed  
in a shell of wood

**I**N RECENT months, motorless flying has made aerial history. New records, new planes, new soaring sites have given fresh impetus to the thrilling sport. Over the wide Chemung Valley, near Elmira, N. Y., a few weeks ago, twenty silent planes wheeled and climbed on rising currents of air in the greatest mass flight of its kind ever seen in America. It came as the climax of the sixth annual competition of the Soaring Society of America.

At about the same time, on the outskirts of the Czechoslovakian village of Brno, farmers watched with amazement

four wide-winged, silent ships drifting down out of the sky. They were manned by Germans competing in the annual meet at Wasserkuppe Mountain. Without motors, they had ridden across country 313 miles to a new world's record.

During the two weeks of this Wasserkuppe competition, sixty sailplanes piled up an amazing total of 22,000 soaring miles. The average for the 513 launchings was more than forty-two miles. Officials recorded forty-one flights of more than 120 miles as well as sixteen that exceeded 180 miles, nine that passed the 240-mile mark, and four that went beyond 300 miles. An interesting sidelight on the distances achieved by modern soaring ships is the fact that all Wasserkuppe con-



testants this year were required to carry passports when they took off at the beginning of the race.

In Russia, where gliding and parachute jumping have become major sports, 100 machines were entered in the eleventh All-Soviet Meet, held a few months ago in Crimea. One pilot looped the loop 300 times during a five-hour flight. Another soared with a passenger for thirty-eight hours and forty minutes. And a "sky-train," consisting of a towing airplane and three gliders piloted by women, covered the 837 miles between Moscow and Koktebel, the Crimean soaring ground, in ten hours.

Strangest of recent competitions was one held high among the ice-covered crags of the upper Alps. With a glacier for a launching field, contestants from several countries soared among the peaks, riding the thin air two miles above sea level.

With a giant, eighteen-passenger soaring ship undergoing tests in Russia; with blind-flying instruments and lights for night piloting being installed in sailplanes; with the *Graf Zeppelin* carrying on experiments in dropping gliders while in full flight, varied

activity is being reported from different parts of the globe.

The latest soaring craft are designed to take advantage of all the "wind escalators," or rising air currents, in the sky. Such machines glide downward in a slow, drifting descent. In strong updrafts, they are like people walking slowly down escalators that are moving rapidly upward, and so gain altitude. By gliding from one updraft to another, they remain aloft, soaring for hours on these rising currents of air.

**C**RACK pilots now practice four kinds of soaring. The first and most common is "slope soaring." It makes use of the wind, deflected upward by a ridge or hill into a strong lifting current. The second is "thermal soaring," making use of the heat currents rising from barren spots on the ground. Pilots have flown for hours over the edge of the Sahara Desert, held aloft by such currents. The third is the exciting sport of "cloud hopping." The soaring ship circles in the column of rising air beneath a cumulus cloud. By "hitching to clouds," in this way, some of the longest cross-country flights have been achieved.

The fourth type of soaring is practiced only by veterans. It is storm-cloud flying, the machine riding the turbulent up-drafts at the front of a thunder storm. So violent are these vertical winds, that on several occasions wings have been snapped off in the air and pilots have had to jump with parachutes.

The most spectacular jump from a glider, undoubtedly, was one made by a test pilot during the recent Crimea meet. Sergei Anokhin, a twenty-one-year-old Russian soaring ace, went aloft

in a special glider designed by engineers for the study of wing flutter and other phenomena which cause structural failure. The machine was built so the pilot could make it fall apart in the air!

Towed to a height of 7,500 feet, Anokhin cut loose from the pulling airplane and pointed the nose of his ship down. While thousands of

#### GLACIER GLIDING

European enthusiasts carrying the fuselage of their ship up the snow-covered slope of a glacier in the Alps for a soaring contest

#### A SKY CARAVAN

Three motorless planes, towed by a powered ship, demonstrate what may be the air transport of the future. Gliders could be cut loose and dropped at any desired points along the train's route



PREPARING FOR A SKY-TRAIN TEST

E. Paul du Pont, Jr., pilot of one of the gliders in the sky-train flight from Miami, Fla., to Havana, Cuba, consulting with the other pilots before the start of the trip





spectators held their breath, he gained speed, plunging downward like an arrow. Then, one at a time, he let the wings and the tail surfaces pull away. Riding the bare fuselage, he dropped 3,000 feet before he jumped and opened his parachute.

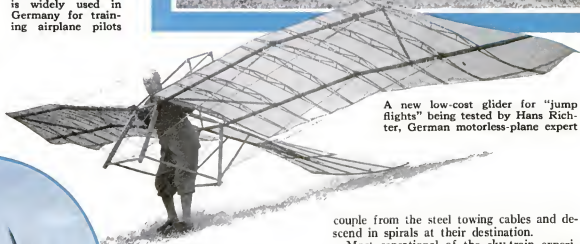
During big competitions, distinctive ceremonies often open and close the contest. At Wasserkuppe, for example, new gliders are christened with bottles of liquid air and at the close of the competition, a wrecked glider is burned to form a bonfire in honor of the soaring pilots who have died during the year.

One spectacular phase of gliding which has come to the fore during the past two years is the use of "sky-trains." This thrilling sport of riding gliders towed by airplanes is expected to have a practical value later on. In Russia, engineers are planning to try out the idea on air-mail runs, the gliders cutting loose and descending with their loads at points along the way.

With an eye to this work, they have supervised a series of pioneer sky-train experiments. During one towed flight from Moscow to the Crimea, the pilot of a glider pumped gasoline through a long tube into the tanks of the pulling plane, thus refueling it in flight.

Another Russian air-train climbed to a height of 10,827 feet and a third landed three times with the glider still attached to the plane to see what would happen if the uncoupling mechanism failed to work in the air. Usually, the gliders un-

A Prueffing glider in flight during a competition at Sutton Bank, England. This type of craft is widely used in Germany for training airplane pilots



A new low-cost glider for "jump flights" being tested by Hans Richter, German motorless-plane expert



A propeller, operated by leg power like a bicycle, is a novel feature of the German machine shown in flight at the left. Below, the craft on the ground with its designer, at right



couple from the steel towing cables and descend in spirals at their destination.

Most sensational of the sky-train experiments in Russia was one reported from Samara. A 625-pound glider was placed on the field and attached to a curious automatic coupling device. Overhead, a circling plane swooped at seventy-five miles an hour, dropped a cable, hooked it into the coupling device and swept the glider into the air with a run of sixty yards. For the first time in history, an aerial "locomotive" had picked up the trailing "car" while in full flight. The feat indicated that small "siding" fields may be all that are needed for picking up and landing the gliders of future sky-trains.

When three gliders are towed by one plane, they are usually attached to cables of different lengths, so the four machines form a diamond pattern against the sky. Occasionally, two gliders are attached in tandem.

**I**N AMERICA, sky-train flying began early. By 1930, Lieutenant-Commander Frank M. Hawks was flying from coast to coast by easy stages in his Franklin utility glider, towed by a biplane. Recently, J. K. O'Meara and other pilots have made sky-train trips between New York and Washington, D. C., and across the ninety miles of sea separating Key West, Fla., and the island of Cuba. The earliest known towed flight in a glider occurred in 1896 when the British pioneer, Percy Pilcher, rode his crude machine for several hundred feet through the air pulled by boys and horses



This giant sailplane, which seats five persons, was part of a sky-train exhibited at the all-Russian competition held in Crimea

tugging at the end of long towing ropes.

Even in model-airplane meets, the sky-train idea is making its appearance. Recently, in New York, a contestant stole the show by sending aloft a twenty-five-inch twin-pusher model pulling two small gliders behind it. Since, he has developed a time fuse which cuts loose the gliders one at a time and permits them to soar down just as do the large machines of a real sky-train when the pilots uncouple them.

Another interesting development which has grown out of soaring is the power glider. From England comes news of a forty-five-foot soaring ship equipped with a retractable power plant. The little engine, and its propeller, can be folded down into the body, making it perfectly streamlined, when the ship is soaring, and it can be raised into position and started when the up-currents fail or the pilot wishes to return to the home field. An auxiliary throttle at the left wing tip makes it possible for one man to move the machine about on the ground under power. Complete, the craft weighs 330 pounds.

A similar machine, designed by the famous Austrian soaring pilot, Robert Kronfeld, recently crossed the English Channel, flying from London to Paris in four hours and five minutes. It was the cheapest flight between the two cities on record. The total coast for fuel and oil for the midsize five-horsepower engine was only \$1.50.

In Germany, another experimenter has equipped his soaring ship with a propeller spun by foot pedals. When updrafts fail, he believes he can pedal on to the next soaring spot. During tests at a Frankfurt airport, not long ago, he made flights of several hundred feet.

Other innovators are also busy with the problem of aiding the soaring pilot. Long cables, wound on drums whirled by motorcycle motors, now pull gliders uphill at German training schools. And, in America, a de luxe trailer for transporting a soaring plane from meet to meet has been developed by Hawley Bowlus, pioneer sailplane maker, of California. Its frame is of steel tubing and it is equipped with bunks so the car crew can sleep on board during long trips. A unique feature is the use of water tanks for holding ballast on either side so the trailer can be trimmed to meet side winds.

IT WAS on such a trailer that the sixty-foot Bowlus "Albatross II" reached the Elmira meet, last year. In this ship, Richard du Pont, the twenty-three-year-old Delaware pilot, soared to a new American distance record of more than 150 miles. Riding thermal currents and "hitching to clouds," he sailed down the foothills of the Alleghenies, over Scranton, Pa., above the Delaware Water Gap, and drifted in for a landing at the Somerset Hills Airport, in New Jersey, within sight of the skyscrapers of New York.

That flight won Du Pont his "D" license, the coveted highest rank in the gliding world. At the time, only one other American, J. K. O'Meara, held the honor and only eighteen people in the world had won the license. The requirements are: five hours continuous soaring, a distance flight of thirty-one miles, and an altitude climb of 3,175 feet. All three marks do not have to be made in the same flight, however.

Had Du Pont been able to soar a few miles further, he would have won the \$3,000 prize offered by his father, Felix du Pont, for the first motorless flight between Elmira and metropolitan New York. Another prize which has stimulated glider activity is the Vincent Bendix Trophy, put up last year. It runs for five years and carries with it a replica of the trophy and \$500 in cash to be awarded to the pilot who makes the longest flight under the rules of the contest during the Elmira meet. If the flight sets a new American record for distance, the cash award is doubled.

From sixty to seventy clubs enter planes in this annual soaring competition and thousands of spectators journey to Elmira to enjoy the (Continued on page 105)

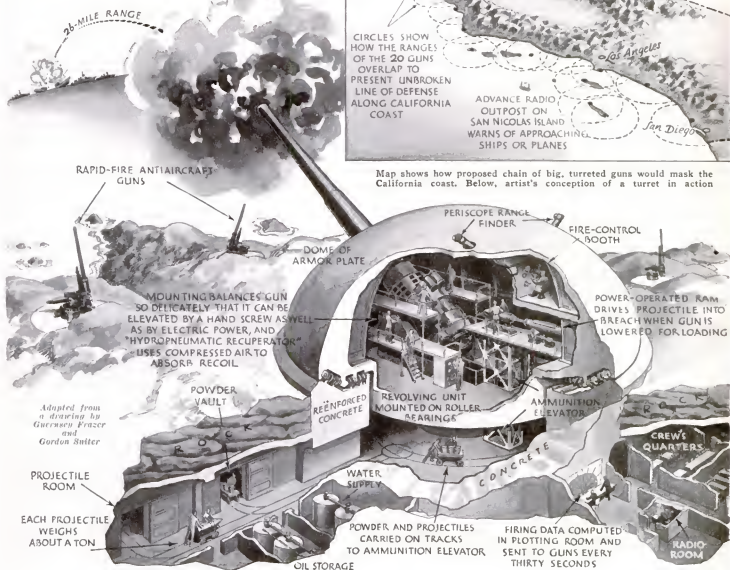


European pilots using a motor winch to tow their craft back to the starting point after a successful flight

The sailplane shown at the left has a retractable auxiliary motor that enables it to rise from the ground under its own power. With a throttle at the left wing tip, the motor is used in taxiing the craft, as illustrated

# Chain of Forts To Guard Coast Line

*Steel-Domed, Rotating Turrets,  
Guarded by Antiaircraft Batteries,  
Will Form an Unbroken Line  
Of Defense for 600 Miles*



Map shows how proposed chain of big, turreted guns would mask the California coast. Below, artist's conception of a turret in action

**T**WENTY batteries of sixteen-inch guns housed within steel and reinforced-concrete naval-type turrets will provide a continuous line of defense for the California coast from the Mexican border to San Francisco, and for the harbors at Eureka and Crescent City farther north. This plan of "perfect defense," drawn up by a California defense committee, has been presented to Secretary of War Dorn and part of the scheme has been approved by the War Department.

Capable of throwing projectiles weighing nearly a ton twenty-six miles against an enemy fleet, twenty batteries, including six sunk on islands of solid rock off Southern California, would present an unbroken line of defense along the 600

miles from San Diego to the Golden Gate.

Plans give each battery two big guns, defended by four of the recently developed 4.2-inch antiaircraft guns, each of which can throw sixteen shells a minute five miles into the air. Each of these antiaircraft projectiles, exploded by a time fuse, would drive down any plane within a radius of 250 feet.

Several of the batteries, particularly those on San Miguel, Santa Cruz, Santa Catalina, and San Clemente islands, would be virtually hidden in the solid rock. Only the crown of the revolving, steel-domed turrets, would be visible. Ammunition would be stored in rocky caverns fifty feet below the surface, and lifted by electrical hoists to the guns. Automatic rammers would speed firing, while elec-

trical aiming gear would facilitate pointing and training. Fire-control officers would look out over the sea through periscopes.

According to plans, each turret would be supported on roller bearings, and could sweep both sea and land in a complete circle. Also, each would be sealed to prevent intrusion of gas from bombs or shells. A spring sleeve on each gun would make the gun opening air-tight, while the air inside the turret and crew's quarters would be maintained at slight pressure to blow out any gas that might enter.

Each battery will be supplied with food and supplies adequate to maintain officers and crews during a six-month siege. Fifty men are believed adequate to maintain each gun during a long engagement.



## NEW DIE-MAKING TOOL SAWS HOLES IN METAL



Using the saw-blade welder on die-maker's band saw. Right, the tool and samples of work



Close-up of "band file," to show how string of files is mounted on a flexible band

**P**RESENTING radical innovations, a new die-making tool speedily cuts holes of any desired shape or intricacy in a metal blank. Formerly it was necessary to drill a row of holes, hammer out the slug, and file off the drill marks. With the new tool, a metal-cutting band-saw blade is broken, passed through a single drill hole, and welded together again with a built-in electric brazer. Thus internal as well as external sawing may be done. A novel "band file," actually a flexible band of files, is interchangeable with the saw blade for internal or external filing.

## CURRENT HEATS WIRE TO CUT DESIGNS IN WOOD

**D**ESIGNS are cut from wood with the aid of heat, by a new tool resembling a scroll saw in appearance. The "blade" is a smooth wire heated by electric current that flows through it when a trigger on a pistol-type grip is pressed. Applied with a gentle reciprocating motion, it cuts the thinnest wood without danger of splitting, and leaves a smooth, black edge which has the appearance of having been finished in this manner.



A smooth wire, heated by electricity in this novel tool, cuts designs in wood like a scroll saw



## ELECTRIC JIG SAW HAS NO MOTOR

**J**IG SAWS that run by electric power but use no motors are now on the market, and the illustration above shows one of the latest types in use. A magnetic coil in the base alternately draws downward and releases a steel diaphragm, which is shackled in rubber and attached to the lower end of the saw blade, the return stroke being provided by a spring at the upper end of the blade. Operated on sixty-cycle alternating current, the tool makes 120 cutting strokes a second. The stroke can be set for any length between one eighth and one half inch. The vibrating blade makes a safe cutting tool.

## CROSS-SHAPED SLOTS HELP GUIDE SCREWS

**S**CREWS and bolts with cross-shaped slots, and special screw drivers to take advantage of their non-skid, self-centering grip, are now obtainable. Screws of the new type may be guided home with positive control of direction, and may be poised on the tip of the driver for insertion in a hard-to-reach place.



## MODEL MAKERS GET TINY POWER LATHE



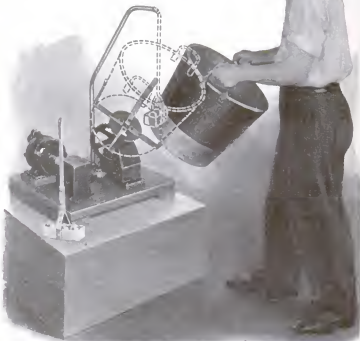
Tiny, electric-powered model-maker's lathe in use for turning. Below, the tail-piece has been removed and it is being used as a spindle carver



**A** NEW aid in model making and in working with modern synthetic resins is a miniature electric-powered lathe. Pieces up to seven inches in length and two inches in diameter may be turned, ground, and engraved; and removing the tailstock of the device adapts it for use as a spindle carver or router. The lathe is powered by a standard type of electric hand tool for grinding, which is utilized as a source of power, and the high speed thus obtained is declared appropriate for working with small pieces.

## OUTFIT MAKES ELECTROPLATING EASY

**E**LECTROPLATING as a money-making venture is easily undertaken with a compact new outfit, according to the maker. Objects to be plated are dropped into a revolving, motor-driven tub; the proper solution is added; and the metal used for plating is placed in a basket and suspended in the liquid. After plating is complete, the rotating tub becomes a tumbler for drying and primary polishing.



Home electroplating outfit. Dotted lines show arrangement for plating



# The Man



**BUTTER** has been used to calk small boats in some parts of the Orient.

**GROUND** in certain sections of Siberia is continually frozen to a depth of 100 feet.

**DUCK QUACKS**, recorded on phonograph records, have been used by hunters to attract wild ducks.



**AMERICAN DENTISTS** use about 500,000 ounces of gold a year.

**AIRPLANE MOTORS** frightened lions in a Chicago zoo, so pilots are forbidden to pass over the park.

**LETTERS** painted on railroad ties tell French airmen the names of the towns they are passing over.

**EELS** twelve feet long live near the Great Barrier Reef, off the coast of Australia.



**SIGHTSEEING TRAINS** stopping at the White Mountains carry bicycles for passengers.

**MILK** contains more solids, by weight, than oysters.

**FIRES** kill 10,000 people a year in the United States.

**APPLES** disagreed with four out of five people examined by doctors at the Mayo Clinic in Minneapolis.

**THE SHELL** of an ostrich egg has a capacity of about three pints.



**INTOXICATION** results quickest in people who have fat livers.

**OPPOSSUMS** were no bigger than mice 35,000,000 years ago.

**CAVEMEN** were left-handed. Most stone-age tools, archaeologists report, were made for left-handed people.

**TANTALUM**, the name of the rare metal, comes from the same root as the word tantalize. It was chosen because of the difficulty met in isolating the substance.

**"MACHINE GUNS"** that shot arrows were employed by Romans in an early invasion of Africa.



## ANIMAL SYMBOLS AID CHILD TYPISTS

**LITTLE FINGERS** quickly master the intricacies of typing, it is said, with the aid of a new keyboard for children, introduced as special equipment for a well-known make of typewriter. Groups of keys to be covered by each finger are distinguished by distinctive colors and by pictures of familiar nursery animals, supplementing the individual letter and character markings. Nine adjustable rings, worn on the fingers, bear corresponding colors and animal pictures. Simply by matching the colors, or the pictures, a child rapidly learns to strike each key with the proper finger, and acquires at the outset the correct fingering method.



Matching animal figures on rings and typewriter keys teaches child correct fingering method.

## PHOTOMICROGRAPHY KIT

A new photomicrographic attachment enables any user of a microscope to make permanent records of his work, even if he has only a casual knowledge of photography. The outfit includes a fixed-focus camera, a light-lock to shield the microscope eyepiece and camera lens, a support that fastens to the microscope stage, and a counterweight that attaches to the base. After the microscope has been focused, the camera is set in place and the exposure is made. Since roll film is used, no darkroom is required for taking pictures.



Exterior of vertical wind tunnel in Germany

## WIND TUNNEL HOUSED IN NOVEL STRUCTURE

AN EXPERIMENTAL vertical wind-tunnel chamber resembling a giant beehive has just been completed in Germany. Within the odd structure, perpendicular gusts of air will be directed against model planes and airships to forecast the behavior of their full-sized counterparts in actual service.



Tiny camera beside a cigarette



Microscope equipped with new camera attachment

## CAMERA FITS PALM OF HAND

So **SMALL** that it looks like a toy, a midget camera just placed on the market is nevertheless declared to be a fully practical instrument. Six snapshots may be taken with a single loading of sixteen-millimeter film. Its fixed-focus lens requires no adjustment for a sharp focus from a distance of five feet to infinity.

## EAVESDROPPING MACHINE AIDS POLICE



A new sound-recording machine which makes its record directly on film without processing. Connected to a hidden microphone, as below, it gathers evidence for police



SECRET CONVERSATIONS, picked up by concealed microphones and recorded on cellulose-acetate film by a new process, will aid police in securing evidence against criminals. The new sound-recording machine, invented by a Chicago scientist, employs a diamond needle to impress a record of speech or other sounds on a

specially prepared sixteen-millimeter film, which is ready for reproduction without processing. To "play back" the sound record, it is necessary only to rerun the film through the machine. This feature is an improvement over former methods.



## TINY WRINGER SQUEEZES AUTO GREASE FROM TUBE

COLLAPSIBLE lead tubes, now employed by some manufacturers for packing automobile gear and chassis lubricants, are turned into grease guns by a trigger-operated tool that resembles a tiny clothes wringer. Rolling up the end of the tube, the tool forces grease into the part to be lubricated. If all the grease in the tube is not used, replacing the cap protects the remainder. The new containers are said to prevent deterioration or contamination of grease, and to provide a neater and more convenient method of handling it. For heavy greases, a wall dispenser is used.

## FIRES OF MARSH GAS KINDLED ON ICE

MARSH GAS, formed by rotting vegetation on the bottom of a frozen Ohio lake, was put to practical use recently by a party of skaters. Noticing bubbles rising to the lower surface of the ice, members of the party cut holes with penknives to tap this natural fuel supply, and touched off the escaping gas with matches. In each case, a yellowish flame shot up from the hole, burned for a minute or two, and then died down. One pocket, three feet in diameter, produced a flame three feet high which burned for five minutes. Whenever they became chilled, the skaters would simply set off another pocket of gas and warm themselves by it. Lighting such bonfires would not be possible on lakes with sand bottoms.



Skaters warming themselves by fires of escaping marsh gas



## SOLDIERS USE MIRRORS TO PRIMP FOR PARADE

FULL-LENGTH MIRRORS, installed as regulation equipment for a battalion of British territorial troops, have helped to make it one of the crack units of the British military establishment. Each soldier is expected to "dress up" in front of one of the mirrors before making his appearance on the parade ground, and the practice leaves little excuse for any irregularity in uniform or equipment.

## DRAFTSMEN EMPLOY SHADOW PRINTING



Accurate shadow outlines, like the one above, are made by sunlight on blue-print paper in the apparatus at right



SHADOW PRINTING, familiar to every schoolboy as a means of making pictures of tree leaves and other objects, is finding new use as a short cut in industry. When an article is to be put into factory production, draftsmen must turn out

rush drawings of a master model. To save the labor of transferring difficult curves to paper by taking elaborate dimensions, the model is now placed in a box with a sheet of blue-print paper and exposed so that the sun's rays strike it at a right angle. From the resulting print, which is developed in the conventional way, an accurate drawing is readily

Third on our list, with 648 inventions, is Carleton Ellis. An interest in amateur photography, as a boy, led him into the field of chemistry. Renowned among his fellow chemists for his improvements in paints, varnishes, and lacquers, he is so much of a specialist that but for one venture afield it would be difficult to bring him out of his Montclair, N. J., laboratory and identify him to the average man.

Seeking a use for the waste products of his industry, the owner of a slaughterhouse once called upon Ellis for help. Ellis mixed the waste with malt and other healthful ingredients, and baked it into nice round dog biscuits. To his dismay, Fido would have none of it. "So I had more biscuits baked from the same stock, but in the shape of a bone," Ellis relates, "and I found that my dog manifested a tremendous interest in the bone-shaped biscuit. To this day I cannot tell whether my dog is interested in the bone-shaped biscuit because it fools him as such, or whether, after my shaping the biscuit in an effort to cater to his taste, he feels duty bound to fool his master by simulating an interest in it." In any event, the artifice works, and that is the true story of the start of the industry based on dog biscuits that look like bones.

As with Ellis, a boyhood hobby became a life work for Henry A. Wise Wood, holder of 434 patents. His high school publication needed a printing press, so he built one. It was the first of a series of presses and other inventions that were to make over the art of printing.

Printing plates for newspapers were formerly made by hand; Wood invented a machine called the "autoplate" that produced them automatically. The invention

yielded him a fortune. With the funds now at his command, Wood could develop his pet ideas about printing-press design. In 1916 he announced a series of inventions that doubled the speed of newspaper presses—an epochal advance. Such presses are fed from a continuous roll of paper, and when one roll was used up it was formerly necessary to stop the press and thread in a fresh roll. One of Wood's major improvements was a mechanism that pasted the end of the new roll to the old one, without stopping or even slowing down the press.

Not devoted to invention alone, Wood has interested himself in public affairs; has written books on social and economic subjects; has started and edited an aviation magazine; and has published a book of poems. Printing presses, however, are his major interest. When a big one is installed, the president of the Wood Newspaper Machinery Company dons overalls and supervises the job himself. His delicately attuned ear can detect the sound of a press with which something is amiss. "It hurts me to hear a machine cry out in agony," he says, "as much as it hurts some people to hear animals in pain. I listen to it, and I know which instrument is doing well and which is not. I do not need scientific apparatus. I can lay my hand on a part and take its pulse."

As might be expected, the four inventors heading our list are comparatively elderly men. Accumulating their enormous totals of patents has represented, for each, nearly a lifetime of work. In contrast, the fifth on our list of inventors is still in his forties, with a brilliant future of achievement still awaiting him.

Already, John Hays Hammond, Jr., has patented 360 inventions. He is the first example we have encountered of a living inventor who has ventured successfully



**ETHAN I. DODDS**, of Central Valley, N. Y., with a portable, electric circular hand saw, one of the best-known of his 321 inventions. He made many improvements in Pullman cars

into many fields. Shortly after completing an engineering course at Yale, he invented the incendiary projectiles used by the Allies in the World War. He was a pioneer in developing radio-controlled ships, aircraft, and guns. His system of remote radio control has been used to guide submerged torpedoes racing at forty to forty-five miles an hour. Others of his radio inventions include the "double-detection circuit," which is the underlying principle of all superheterodyne receivers; and a system of radio telegraphy enabling eight messages to be conveyed simultaneously on one carrier wave, which has been employed by the U. S. Army and Navy. Turning to the field of music, he designed the first pipeless pipe organs, which employ ingenious arrangements of oscillating electrical circuits to produce their tones. In one week during the last summer, eighteen U. S. patents were issued to him.

Sixth in inventive productivity is Clyde C. Farmer, with 344 patents—and once again we encounter a specialist in invention. Associated with the Westinghouse Air Brake Company, he has been a leader in developing air brakes for all types of applications, including those for motor vehicles.

It is not until we reach the seventh name on our list—that of Ethan I. Dodds, of Central Valley, N. Y.—that we come to a prime example of the old-school inventor of diversified talents. With no academic education—he could hardly read until he was twenty-one—Dodds began inventing as a boy in the coal-mining country of Pennsylvania. Starting as a blacksmith's helper in the Westinghouse works at Pittsburgh, Pa., he soon became George Westinghouse's right-hand man. When Marconi came to Westinghouse with his first models (Continued on page 104)



**YOUNGEST LEADING INVENTOR** is John Hays Hammond, Jr., holder of 360 patents. He has made many important inventions in the field of radio. One of his most recent patents covers a torpedo that is detonated by a controlling light beam





# Skyscrapers Torn Down



Photo Courtesy "Construction Methods"

A power shovel being used to push over a two-story brick wall after the interior has been gutted, thus saving labor

At left, harmen demolishing a brick wall with sledge and crowbar. This difficult and dangerous method is being replaced by modern technique

**W**HILE crowds in New York City's theatrical district watched in fascination, not long ago, a ninety-foot crane lifted a 3,000-pound iron ball by a heavy chain and swung it, again and again, against the wall of a partly demolished building. Under the terrific blows, five stories above the ground level, the wall shivered. Great, crumbling chunks fell inward. When it was pounded away, down to the second floor, a power shovel attacked it, poking, biting, shoving, and finally toppling it over into a huge heap of debris, to be scooped into trucks and hauled away.

That was the last of a group of thirteen buildings, from five to ten stories tall, fronting on an entire city block. Tearing them down took just forty-four days, and the wreckers received a \$12,000 bonus for finishing the job two weeks ahead of schedule.

I talked with officers of that wrecking firm, the Albert A. Volk Co., and learned that demands for speed and economy have brought revolutionary changes to the industry. Literally, it has been turned upside down. Skyscrapers are now wrecked from the bottom, up. Demolition starts in the basements.

New tools have been devised. New and ingenious use has been made of machines originally built for other purposes. Equipment designed for construction has been put to work in reverse, tearing down buildings instead of erecting them. Even the

rural districts have lent an instrument for this typically city job; tough uprights of wood and masonry now are yanked down by stump pullers.

It was on a nine-story building that the company, seeking greater speed and economy, first developed the sensational "upside down" method.

Ordinarily, after removal of all parts that could profitably be salvaged from the interior of a building, wreckers began on the top floors. Debris was dumped down chutes, and sometimes it had to be carried considerable distances to get to them. Then, as the structure came down, the chutes had to be rebuilt or adjusted to receive wreckage from the lower stories. When a floor was torn out, any rubbish that fell through had to be handled again, at the next lower level.

"It happens that our company does excavating as well as wrecking," Albert Volk, the president, told me, "and we saw amazing similarities and contrasts between the two. In each, the job is to get the debris loaded into trucks. But we saw how much cheaper and quicker a power shovel was, than all that manual labor of feed-

ing the chutes. Of course, you couldn't send a power shovel up to the top of a building. But we found a way to get the building down to the shovel."

In applying the new idea, the first step was to take out the street-level floor and clear the basement of partitions, pipes, and everything that might interfere with the shovel. Then, holes were cut in the second floor. Interior partitions and walls were torn out and dropped through the openings. As the wreckers worked upward, a floor at a time, they tumbled all debris through the holes underneath, straight down to the basement. Then they tore down the outer walls from the top, dropping the wreckage inside the empty shell of the building.

By the time the walls were down to the second story, the growing heap of debris was level with them. Now the contractors had just what they wanted. A steam shovel could handle this part of it, walls and all. The demolition of a building had been

## HOW WRECKERS WORK IN REVERSE



1 After clearing the basement, wreckers work upward from floor to floor, tearing out walls and partitions as they go



2 Debris thrown down from the upper floors accumulates in the basement, the shell of the building serving as a chute



# from the Ground Up

By JESSE F. GELDERS



Part of a building being torn away by pressure applied by a series of jacks. At the right, a workman is cutting through steel girders with an acetylene torch.



turned into an ordinary excavation job. That structure had been one of two identical units. Starting to wreck the twin at exactly the same time, the company had used the old system, for comparison. The upside-down method won the unique race by several days and showed a large saving in costs.

It was soon applied to a twelve-story, modern fireproof building, with similar success. Workmen with sledges and pneumatic drills broke through the concrete floors, according to the same plan as before. Stripping down the outer walls, they left only the bare steel frame.

Taking down the steel skeleton was then, as always, a task requiring the same sort of skill and daring as putting up the steel in the first place. Instead of riveters, burning crews clung to the dangerous perches, and with oxyacetylene torches cut through the beams and girders. A guy derrick, like the one which had first lifted the steel into place, hitched onto each piece, just before it was burned free, and afterwards lowered it to the ground.

Since the upside-down method was first used, many effective and spectacular additions have been made to the wreckers' equipment.

DEBRIS, hurtling down from above, always has been one of the worst hazards of demolition. On an upside-down project, the workmen were never allowed to travel through the interior of the building, outside passages always being provided. But when a twenty-story office building was to be wrecked, a short while ago, a strange, inclosed stairway was erected on the outside, with unusual speed.

It was the newest type of portable fire-escape.

Modern, mechanically operated scaffolds, such as bricklayers use in erecting walls on steel-frame buildings, have been adapted to the wrecking of the same walls. Formerly, the "barmen," working with sledges, drills, and pointed, bent bars, either stood or sat on the walls and tore them down, almost underneath themselves. Twenty stories above the street, that could be a ticklish job, as the men leaned over to work on the outside face of the wall, toppling the debris inward to avoid injury to persons below.

Now the barmen work from scaffolds attached to the building's steel frame, independent of the wall they are smashing. They pound and pry the masonry away in front of them, instead of beneath. The cranks and winches which enable bricklayers to lift such scaffolds smoothly as their work progresses, now help the barmen to follow the receding walls downward in greater safety.

The tremendous "cannon ball" which often takes over the barmen's work at lower levels, with a sensational power-driven bombardment, is handled according to a carefully thought-out plan.

It was used first, several years ago, on an office building which had been torn down to the fifth floor. A few hefty swings of such a tremendous weight might have been enough to make the walls collapse. But that, in Volk's words, "would have made a mess." Twisted steel and heavy timbers, all tangled together and partly submerged in a goulash of masonry, would be extremely difficult to clear away. In spite of apparent confusion, successful demolition must be orderly. So the contractors devised what they call "the Dempsey method."

The crane operator hoisted the iron ball nearly to the top of the wall, and gave it a nice little swing. It struck a vicious blow, and the wall trembled. Just as Jack Dempsey's body punches prepared opponents for the final knockouts, repeated blows of the 1½-ton iron fist "softened" the wall. A section at a time fell, the masonry completely shattered. It was in perfect condition for a quick job. (Continued on page 112)

## TO DEMOLISH LARGE BUILDINGS



3 After the framework is removed, scaffolding is built outside the walls and they are demolished from the top down



4 When the walls are down to the second story, a power shovel attacks them and scoops up the accumulated debris



## SHIPS' LIFEBOATS GET RADIO EQUIPMENT WITH RANGE OF MORE THAN FIFTY MILES

New U. S. Department of Commerce regulations for safety at sea, taking effect January 1, require ocean liners to equip motor lifeboats with radio apparatus capable of communicating at least fifty miles on the international distress frequency. Accompanying photographs show the latest type of radio equipment designed especially for this purpose. Tests show that the set, which recently was installed on a lifeboat

of the S. S. *Pennsylvania*, of the Panama Pacific Line, will operate normally when it is drenched with water, and may even be submerged completely for a short time without impairing its operating efficiency.



Lifeboat of S. S. *Pennsylvania* equipped with new radio apparatus and collapsible masts. At top of page, an interior view showing set under test



## SAWHORSES ASSEMBLED WITH HANDY BRACKETS

SAWHORSES of any desired size are quickly assembled from standard lumber, without need of boring holes, driving nails, or cutting braces, through the use of new metal brackets that clamp the legs and top together. The picture above shows a sawhorse made up with brackets designed for two-by-four legs and a two-by-four top set edgewise. Similar brackets are available for use with two-by-four legs and a two-by-six top, set flat. The accessories are declared a convenience for home workshop enthusiasts, as well as for carpenters, painters, and interior decorators.

## NEWSPAPER READS ITSELF ALOUD

A "TALKING NEWSPAPER" that will read itself aloud to you is a recent invention. Its pages may be printed on standard presses, but instead of words they bear a pattern of printed dots and lines, serving as a sound track. When the paper is placed in a special reproducer and the machine is started, the events of the day are related verbally, without further attention on the part of the listener. The reverse side of each page is printed in standard type, for those who prefer to do their reading in the conventional way. The inventor, a young Argentine engineer, is seeking to interest publishers in his plan, which includes supplying subscribers with the reproducing machines.



A "talking newspaper," printed with dots and lines for a sound track, being placed in a reproducer which will read it aloud. One side of each page is printed in regular type, as seen at left

## SIMPLIFIED PROCESS PRINTS COLORED PHOTOS ON PAPER



Above, special film for printing photos in natural colors being separated from paper backing. Left, combining the three colored positives to form the finished print. Right, compact kit containing necessary materials

THROUGH a simplified process, any amateur may now produce natural-color photographs on paper. An ordinary camera, standard films or plates, and the conventional filters for three-color work may be used for making the three negatives required. These are printed or enlarged upon special, paper-backed film, which is easily separated from its support in the hypo bath and may be handled freely without fear of damage. The resulting film positives are chemically toned to blue-green, magenta, and yellow, and are squeezed in registry upon a white paper mount to form the finished print. Less than an hour is said to be required to complete the whole printing process.

## CAMERA AMATEURS PHOTOGRAPH RADIO STARS AT THE MICROPHONE

WITH seventy-five cameras going into action, a New York broadcasting studio recently inaugurated an amateur photographer's night at which enthusiasts could bring their equipment and snap the performers in action. Special lights permitted fast shots and platforms at three levels enabled the cameramen to focus and snap their pictures without interfering with one another. The pictures taken were eligible for entry in a contest.



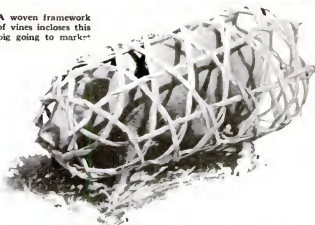
At the right is a scene in a radio broadcasting studio with camera fans assembled to take pictures of the performers at the microphone



## TEST CABINET LETS WOMEN TRY PERFUMES

BY COMBINING the electric brain of the automatic telephone and the latest principles of air conditioning, a young inventor has developed a unique perfume-sampling cabinet. Customers enter the booth and, by pressing buttons, cause different atomized perfumes to fill the chamber and then be flushed out by a rush of fresh air. Signal lights similar to those on a telephone switchboard indicate which perfume is being sampled. Thus, in a few minutes, the customer can test the scents she is interested in. No perfume clings to her clothing when she leaves the booth.

A woven framework of vines incloses this pig going to market



## HOW SIAMESE PIGS GO TO MARKET

PUTTING a pig in a package saves trouble for Siamese farmers going to market. The package consists of a framework woven of vines or fibers. Encased in it, with its head, tail, and feet protruding, the porker travels under its own power. Handles on the framework enable the owner to steer the animal and keep him from straying.

A customer sampling perfumes in a new air-conditioned booth by means of automatic controls. After each test, fresh air clears the cabinet





Camera with sixteen-foot lens tube, as it will appear in use for photographing stratosphere balloons

A CURIOUS CAMERA that resembles an antiaircraft gun has been perfected at Wright Field, Dayton, Ohio, to take pictures of stratosphere balloons from the ground. The instrument, using a lens set at the end of a sixteen-foot barrel, is said to be the longest-focus portable camera ever constructed. It permits clear pictures to be made of a balloon 70,000 to 80,000 feet above the earth. For use, the "stratosphere camera" is stowed aboard an airplane and the pilot follows the movements of the balloon, landing whenever a picture is to be made. In this way it is possible to record facts of scientific interest pertaining to a flight, including the change in shape of the balloon as its gas expands in the upper air.

## SPARK PLUG HAS POINTS RECESSED

FIRING POINTS of a new spark plug, instead of being exposed as in conventional types, are recessed within a metal chamber designed to serve as a preheating element for fuel. Vapors within this pocket are first ignited, projecting a flame into the cylinder that is said to assure instant and complete combustion. The illustration shows one of the new plugs, at right, compared with a standard type.



## NEW METAL MAKES STRONG MAGNETS

BETTER radio loudspeakers are promised by a newly discovered metal alloy that can be magnetized far more strongly than any hitherto in use. Magnets made from the new material have proved powerful enough to support sixty times their own weight—a feat considered remarkable for a magnet of the "permanent" type, which is familiarly exemplified in the small horseshoe magnets sold as toys, and which requires no electric current to operate it. Permanent magnets of the latest type are expected to replace electromagnets in modern dynamic loudspeakers and other devices where strong magnetic fields are required. The new magnet metal, announced by General Electric Company engineers, is composed of aluminum, nickel, cobalt, and iron. The combination was being developed as a heat-resisting alloy when a check-up of all its properties revealed its unexpected magnetic qualities.



Permanent magnet made of a new alloy, which was used in the test shown at the right



A fifty-eight-pound radio cabinet being supported by a permanent magnet that weighs less than a pound

## TINY PROJECTOR LAMP

A MERCURY-VAPOR lamp now being developed for use in projectors is so small that it may be held in the palm of the hand. Its light, however, is reported more brilliant than that of an electric arc.



At left, a pair of shoes soled with discarded auto-tire tread, being worn by a native of Kurdistan. Below, top and bottom views of shoes showing design



## SOLE SHOES WITH OLD TIRE TREAD

DISCARDED auto tires are being put to practical use in Kurdistan, in western Asia, where native craftsmen have discovered that the rubber treads furnish excellent soles for shoes. Tops are fashioned from the wool and hair of their sheep and goats. The resulting footgear is reported to be comfortable, waterproof, and long-wearing, and has found favor with inhabitants of the region, who are not averse to taking advantage of products of civilization that happen to fit in well with their traditional styles and customs.

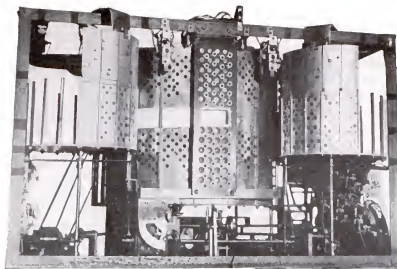


## TOAST SCULPTURE IS NOVEL HOBBY

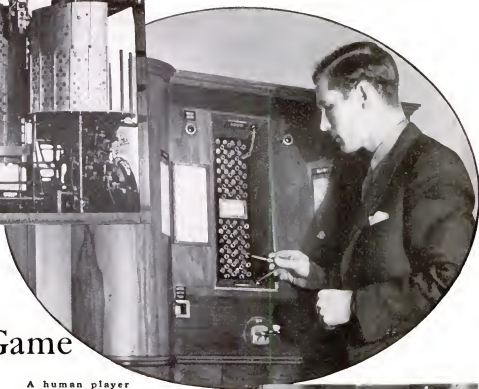
WHEN he is not busy making sandwiches for customers, Louis Strakes, counter man in a New York City sandwich shop, indulges his fancy for creating statuettes and caricatures from toast. The proprietor encourages his unusual hobby, for the odd pieces of sculpture, placed in the window of the establishment, help attract patronage. An electric toaster, a few slices of bread, a knife, and a box of toothpicks are the only tools and materials Strakes uses to produce a statuette like the trotting scene illustrated above; the picture at left shows him at work on another. Dark breads provide color effects.







View at left shows ingenious robot bridge player, with front cover removed to disclose complicated mechanical parts. At the center of the machine is a rotating drum on which panels of hands are mounted



A human player matching his skill with that of the automaton

## Bridge-Playing Slot Machine Puts Up Good Game

DEVOTEES of bridge may indulge their fondness for the game with the aid of a new bridge-playing automaton. When a coin is dropped in a slot, lighted symbols representing cards appear in panels labeled "North" and "South." The latter is the hand of the player, who is declarer; "North," his partner, is dummy. A printed legend, appearing in a window, explains the bidding and the contract arrived at. To play any card, a plug resembling a telephone jack is inserted opposite it. One of the imaginary opponents, "East" or "West," automatically responds by play-

ing a card, whose illuminated symbol appears in a side panel. Tricks taken by the player, who can win if he plays correctly, are shown by numbers in a lower window. The robot, a marvel of mechanical ingenuity, contains assorted bridge hands, arranged in panels on a drum that turns to display one set at a time. Cards played by "East" and "West" are picked out by an intricate electrical selector resembling a dial telephone switchboard.



"North" and "South" panels, representing player and dummy. Illuminated symbols designate cards

## BABY CARRIAGE IS STEERED BY HANDLE

EASY to guide, a baby carriage with a built-in steering control has been devised. The frame of the handle is attached to a swivel base, and pushing it toward either

side operates a steering yoke that turns the front wheels, making it unnecessary to lift them from the ground in turning a corner. In the illustration, the body has been removed to show the swivel base to which the handles are attached, and the steering yoke.



Baby-carriage chassis, showing steering mechanism

## ODD RACING BIKE HAS PEDALS BEHIND

OPERATED from a crouching position, a racing bicycle designed by a British inventor is said to permit greater speed and maneuverability than conventional models, and to be propelled with a minimum of exertion on the part of the rider. Instead of being mounted between the wheels, the pedals and gearing are supported behind the rear one. There are no handlebars in the ordinary sense, the machine being steered by grips mounted partway down the spreading front fork.



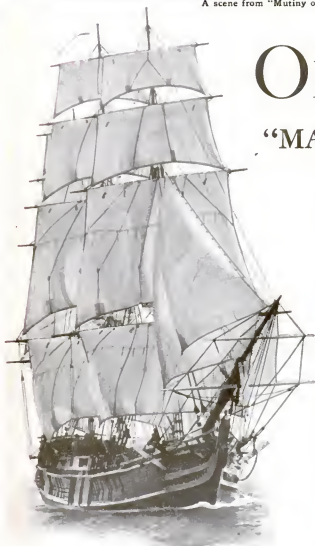


A scene from "Mutiny on the Bounty," showing former cargo carriers rebuilt as eighteenth-century vessels

# Old Sailing Vessels

## "MADE UP" AS FAMOUS SHIPS

### for the Movies



H.M.S. *Bounty*, as reproduced by movie shipbuilders. The ship was formerly the two-masted schooner *Lily*

**A**NCIENT WINDJAMMERS, rescued from the oblivion of Pacific Coast shipyards, are reviving the glories of famous ships of history and romance. Carefully reconstructed under the guidance of Hollywood research experts, they sail proudly before the eyes of movie cameras as reproductions of such storied vessels as H.M.S. *Bounty* and the *Hispaniola* of "Treasure Island."

For example, the high-pooped eighteenth-century armed transport that forms a setting for most of the stirring events of the film version of "Mutiny on the Bounty" is literally built around the hull of the old two-masted schooner *Lily*, a former cargo carrier. When Hollywood producers decided to film the story of the famous mutiny, they ransacked shipyards for suitable sailing vessels. With four other veterans of sail, the *Lily* was brought out of retirement and placed in the hands of skilled shipbuilders at Wilmington, Calif., where many other ships have been "made up" for important rôles in the movies.

Working from old plans of the original *Bounty* and details from the narrative of Capt. William Bligh, her commander on her ill-fated voyage to the South Seas, modern shipwrights began their task of reproducing the historic vessel. To begin with, the hull of the *Lily* was far too narrow. Built on rakish lines, she lacked the breadth of beam of a man-of-war of 150 years ago. To remedy this defect, new ribs were placed around the original hull and covered with planking. The space between this outer covering and the original hull was filled with concrete, which served the useful purpose of ballasting the ship.

In place of the *Lily's* fore-and-aft rig, the movie *Bounty* was given three masts and a square rig like that of her famous predecessor. Every



This twenty-seven-foot model of the *Bounty* was built for use in shipwreck scenes. It is powered with an automobile engine

*How Hollywood Shipbuilders  
Take Veteran Cargo Carriers  
Resurrected from the Ship  
Graveyards of the Pacific and  
Rebuild Them for Roles in  
Film Dramas of the Sea*



detail of the complicated rigging is faithfully reproduced.

Frowning through ports in the after part of the upper deck are four four-pound cannons. She also carries a pair of swivel guns mounted on stocks forward, and six aft.

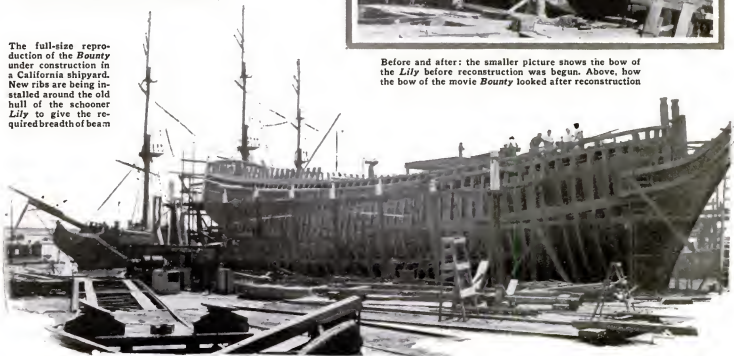
In contrast with the year it took English shipwrights to build the original *Bounty*, movie workmen transformed the *Lily* into a full-size reproduction of the old ship in only twenty-eight working days. Ten thousand dollars was paid for the schooner, and it cost another \$50,000 to rebuild her. Hollywood does not consider that an excessive price to pay for a film shipwreck, but because old sailing ships are getting scarcer every year, it was decided to build a smaller model for use in scenes depicting the wrecking of the ship at Pitcairn Island.

Only twenty-seven feet long, this miniature *Bounty* reproduces the larger vessel in every detail and is perfectly seaworthy. In addition to a full set of sails, it carries an automobile engine geared to a concealed propeller which kicks the tiny ship along in realistic style. Fitted with buoyant tanks, it was "wrecked" on the California coast, and later repaired for exhibition.



Before and after: the smaller picture shows the bow of the *Lily* before reconstruction was begun. Above, how the bow of the movie *Bounty* looked after reconstruction

The full-size reproduction of the *Bounty* under construction in a California shipyard. New ribs are being installed around the old hull of the schooner *Lily* to give the required breadth of beam



# Marvels of Modern

## BRING THE ORANGE TREE

By  
ANDREW R. BOONE



A lemon, on the tree, being gauged for size before picking. If the fruit passes through a silver ring carried by the picker, it is considered too small



A picker unloading his canvas sack into a field box. The picking sack opens by means of a flap at the bottom, so that the fruit can be removed from it without bruising. Gloves are worn to avert finger-nail cuts on the fruit



Below, oranges are seen rolling across the sizer, in which rows of spreading rollers allow the fruit to drop into different bins, according to size. After this, the oranges are wrapped in tissue paper and packed

Fresh from the tree, these oranges are being cleansed in a bath of soapy water before passing on for grading and sizing. Soft brushes and a cool shower aid the soap

**A**T a cost of only ten cents a carload, the spinning brushes of an automatic machine now coat California oranges and lemons with an invisible covering of wax. It prevents shrinkage and loss of moisture, produces a pleasing gloss, and delivers the fruit to distant parts of the world as fresh as when it was picked from the tree.

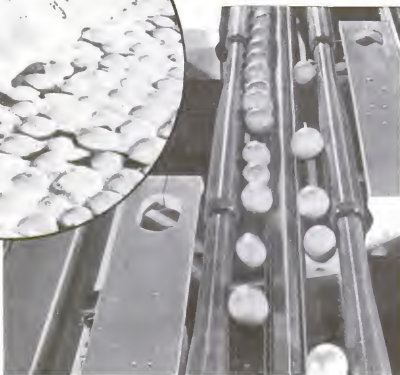
This device is the latest addition to a host of scientific aids which are giving the citrus-fruit industry a mechanized efficiency rivaling that of a motor-car assembly line. Specially designed oil heaters, gas tents, size rings, picking bags, conveyors, mechanical scrubbers, waxers, and packers carry the product from grove to market. To follow the life history of a modern orange or lemon is to encounter an endless succession of innovations produced by science.

In the battle against insects, for instance, special tents envelop the trees. Their cubic capacity is printed on the outside. Workmen with wheeled tanks of cyanic acid gas move down the rows, a gauge on the tank showing just how much of the deadly fumes will be needed to kill pests within a tent of any given size.

When picking time arrives, workers wear gloves and snip off the fruit with miniature pruning shears. Oranges usually are picked by color, lemons by size. Lemon pickers carry in the left hand a metal ring, from two and a quarter to two and three eighths inches in diameter. If a lemon passes through the ring, it is too small and is left on the tree for the next picking, six weeks later.

To prevent bruising of the fruit, the sacks used by pickers are designed so the bottoms can be opened by loosening a cord. When full, the bags are set down in the picking crates, the cords are jerked free, and the sacks are lifted away from the fruit. On endless belts, the boxes ride to the packing house and its battery of ingenious machines.

At warehouses of the California Fruit Growers' Exchange, an organization of growers which supplies three fifths of the oranges sold in the United States and Canada, and nearly four fifths of the lemons,





# Fruit Packing...

## TO YOUR BREAKFAST TABLE

the boxes of fruit are allowed to stand for a day or two to permit some of the moisture in the rind to evaporate and thus make the skins less easy to injure.

Then, the automatic machines go into action. One dumps the boxes of fruit onto a padded conveyor, while the empty crates continue on their way to be stacked for future use. Oranges roll into a warm, soapy bath where whirling brushes remove the dust of the grove. From this washing tank, they pass under a rinsing shower of cold, clear water and continue on rollers which are designed to prevent bruising of the fruit, while a blast of air thoroughly dries the skins of the oranges before they reach the waxing apparatus.

In this new device, two long brushes, like parallel cylinders revolving toward each other, pass over blocks of paraffin and coat the oranges with a thin layer of protecting wax as the fruit rolls down the trough between them. This waterproof and air-tight envelope seals the fruit and enables it to reach the consumer in "tree-fresh" condition.

Beyond the waxer, an endless belt carries the oranges past experts who separate them into different grades. Each grade is placed on a separate conveyor which delivers the fruit to the sizer. On the way, the oranges are automatically weighed or counted. A record is made of the amount of fruit of each grade which each grower sends to the central packing house.

In the sizer, a series of spreading rollers permits oranges of different sizes to drop into different canvas bins. From these bins, packers take the fruit, wrap it in tissue paper, and place it in crates for shipment. Skilled workmen can pack as many as seventy-five boxes of oranges a day. Like all others who handle the fruit, the packers wear gloves to prevent finger nails from injuring the skins of the oranges.

Because of their shape, lemons require more handling in the packing house

Roller brushes, revolving on blocks of paraffin, put a thin, protective coating of wax on oranges. This prevents shriveling and keeps fruit fresh

than do oranges. The packers select, by eye, fruit of uniform size as the lemons pass in front of them on moving belts. The smallest-size lemons are packed 540 in a box. The largest run 240 to a box.

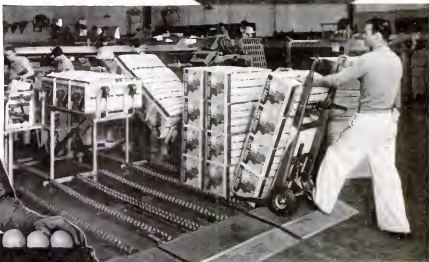
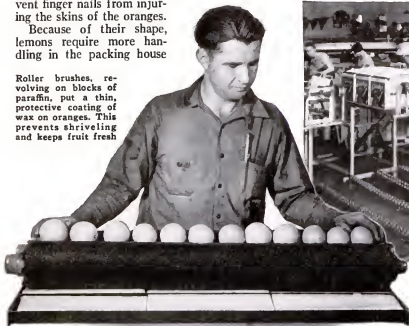
Before oranges are packed, a sample is withdrawn from each shipment received at the plant and put through a titration and specific-gravity test to determine the proportions of sugar and acid in the juice. The ideal blend, science has discovered, is eight parts of sugar to one part of acid. Any crop that does not come up to a set standard fixed by the association is not packed.

While the fruit is being examined, treated, selected, and wrapped, high-speed machines are turning out as many as 3,600 orange crates a day. Other machines nail the ends of the covers on the filled boxes and place a metal band around the middle without crushing or bruising the fruit. As each crate reaches such a lidding machine, it halts momentarily while  
*(Continued on page 101)*

At right, a laboratory worker is determining the ratio of acid to sugar in a grower's crop. If the fruit does not come up to a fixed standard, the packer rejects it



An inspector takes an orange's temperature—a test repeated at re-icing stations as the shipment goes to the market



Automatic stackers, like those seen in the picture above, deliver stacks of four boxes each to pneumatic-wheeled trucks to be wheeled to the precooling room for temporary storage

# American Flyers Lead

By JOHN E. LODGE



Loading a transport plane with sandbags for an attempt at a record in pay-load flying. To check the load accurately, each bag is weighed individually

A timing station at one end of the course of a National Air Race meet. Two separate systems are used, one employing a plate camera, the other, movies

**UNCLE SAM**—Ace Record Holder of the Air. That is a new title which swift planes and daring pilots have brought to this country. For the first time in seven years, France has lost the lead in aerial records and the United States has swept into first position.

Howard Hughes, flashing across a California beet field in a \$200,000 racing plane; Benjamin King, drifting down the Atlantic coast in a two-cylinder seaplane; D. W. "Tommy" Tomlinson, with his robot pilot, roaring over the Willoughby Spit course—all these men in recent months have piled up new marks that have carried America into the lead.

The drive for new records began early last year. Officials of the National Aeronautic Association, the American branch of the world governing body, the Federation Aeronautique Internationale, encouraged manufacturers and pilots to try for new marks. In our dramatic climb to first place we have set more than twenty international records since August 1, 1934. The giant Sikorsky S-42 piled up ten marks alone and Tomlinson's Douglas DC-1 added nine. The score then stood: France, forty records; the United States, thirty-nine.

It was a Washington, D. C., civil engineer and sportsman pilot, Benjamin King, who put America over the top.

One Tuesday, last summer, King

climbed into a little Aeronca light plane at Port Washington, L. I. The thirty-six horsepower air flivver had been equipped with pontoons. Skimming the water of Long Island Sound, it soared away into the south.

Down the East River, over the tip of Manhattan Island, above the Statue of Liberty, along the New Jersey coast, across Chesapeake Bay, up the Potomac River, the little machine winged its way. Over the Naval Air Station at Anacostia, D. C., its eight-gallon fuel tank was nearly dry. King eased back the throttle and coasted down for a landing. The Aeronca had flown 221 miles, airline, a new international record for machines of this type. Added to other marks made by King a few days previous, it put America ahead of France.

Other pilots, Art Chester in his Chester Special; Helen MacCloskey in her Monocoupe; Brig. Gen. Frank M. Andrews at the stick of his 1,400-horsepower Martin seaplane; Maxine Bennett in her Spartan, also contributed to our total.

Such records don't just happen. Pilots don't take off on the spur of the moment and set a new world mark. Weeks, and even months, of preparation go into the burst of speed or the climb into thin air which makes aerial history. The millions who read headline stories of such achievements know little of the behind-the-

scenes activity for such performances.

They never hear of the dress-rehearsal flights that make pilots and timers letter perfect in their jobs; of the laboratory tests that ferret out minute and hidden flaws in recording apparatus and stop watches; of the searching examinations that pick the best men to officiate at record tests; and, finally, of the hundreds of pages of technical data which accompany the reports sent in by these officials. Yet, it is this care and preparation that make record marks of value.

Thirty years ago, when balloons still held the center of the stage, eight nations sent representatives to Paris and formed the Federation Aeronautique Internationale. One of its main purposes was to standardize the conditions under which aerial records are made. By making the rules for such attempts universal, it provided equal opportunities for airmen in all parts of the world.

Today, thirty-four nations are members of the international body. The National Aeronautic Association, with headquarters in Washington, D. C., is the American branch. It is in direct charge of all attempts to break records in this country. Certified stop watches, barographs, and electrical timing apparatus are rented out for such trials by its contest board, of which William R. Enyart is chairman.

To obtain an F.A.I. certificate, stop watches have to pass an exhaustive laboratory test that lasts for months. They are calibrated in six positions and must be accurate to within one one-hundredth of a second in each position for a certain length of time. In addition, they must pass heat and cold tests. So exacting are these requirements that only two out of six Swiss stop watches, which have the reputation of being the best in the world, passed the test during a recent examina-

# World in Air Records

tion. The watches that meet the requirements get a certificate that is good for two years. Only such watches can be used in timing official trials.

They are rented out for \$5.00 for two weeks and fifty cents a day if kept longer and a deposit of \$100 is required. Barographs for speed and distance flights have the same rental fee with a \$50.00 deposit required. Special barographs for high altitude trials need a \$300 deposit and rent for \$20.00, plus \$3.00 a day if kept longer than two weeks.

Each barograph is calibrated before it leaves Washington and is inclosed in a metal container. Just before the take-off, the instrument is officially sealed and, at the end of the flight, it is placed in the container and sent by express to the N.A.A. headquarters. With the seal still intact, the barograph is delivered to the U. S. Bureau of Standards for final calibration.

A girl parachute jumper and her pilot testing oxygen apparatus before trying to break the world's record for altitude parachute jumping



CHECKING A  
HIGH-FLYING RACER

This section of film shows the record made by a cine-theodolite as a high-flying plane is "clocked." Above, a group of officials is gathered about an ordinary theodolite ready to record the end of a similar flight

The highest charge of all is made for the delicate transit cameras and electrical timing devices used for straightaway speed attempts. They cost \$75.00 a day and this does not include wiring the course for the installation.

Last spring, when Tomlinson set his string of new records, his great silver plane flew at an altitude of more than two miles. Timers watched through three special theodolites, surveyor's instruments, which showed them when the plane passed a certain point in the sky, in order to time the start and finish of Tomlinson's long race against the clock.

Five times, he circled the 621-mile triangle, rushing southwest from New York to Washington, D. C., east to Norfolk,

Va., and north again to Floyd Bennett Field. His plane carried more than 1,600 gallons of fuel and covered more than 3,100 miles. Most of the time, the Sperry robot pilot guided the plane and during the whole flight Tomlinson and his copilot, Joseph Bartels, were in constant radio communication with officials and timers on the ground.

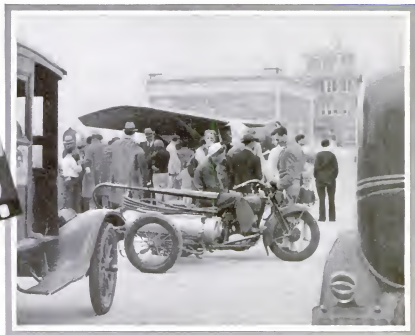
Sometimes, in high-speed tests, cine-theodolites, combined moving-picture cameras and theodolites, are employed to time streaking planes as they cross the start and finish of a course. Another aid for timers is a stop watch with a dial on the back which instantly translates split-second time into miles per hour.

In addition to the rental charges for certified timing equipment, there are a number of fees which a record-setting pilot has to pay. The sanctions fee, for permission to make an official attempt, runs from \$10.00 for gliders, to \$100 for maximum-speed trials. The calibration of barographs costs from \$5.00 to \$10.00. The registration fee for a national record is \$10.00; for an international record, \$20.00. And, official timers, of whom there are seventeen in the United States, are authorized to charge up to \$25.00 a day for their services.

Frequently, however, these men contribute their time gratis or for traveling expenses. They are appointed by the N.A.A. for one year at a time and must pass rigid examinations on the care and operation of stop *(Continued on page 108)*



Below, a motor-cycle fire-extinguishing unit used by the U.S. Navy to safeguard take-offs of heavily fueled planes. This apparatus is always on hand when a land plane tries for a record in long-distance flying



# Mysterious Diseases

## BAFFLE MEDICAL SCIENCE

**H**EARTS that whistle, ears that tick like watches, skins that turn all colors of the rainbow, patients that swell up like balloons and have to be punctured with hollow needles, muscles that literally turn to limestone—such are the mysterious maladies met by a practicing physician.

He often finds himself an explorer in a puzzling realm of strange diseases. He encounters bewildering ailments that form the oddities of the medical world. His records read like improbable flights of fiction. Yet, they concern fact-cases examined with scientific care.

Here are three examples. They are picked at random from the recent records.

In the balcony of a London, England, theater, an elderly man struck a match to light a cigarette. An instant later, there was a burst of flame and a sharp report. The unlighted cigarette shot halfway across the interior of the theater. The man's breath had exploded!

When Dr. Terence East examined him at the King's College Hospital, he found that a diseased condition at the lower end of the stomach permitted food to remain in his body far beyond the normal time. Excessive fermentation produced inflammable gases and these combustible vapors had exploded as soon as the match flared in front of his mouth.

Last year, in a western city, a young man began to notice a strange weakening of his muscles. They looked as big and strong as ever, but they became so impotent he could not do even the lightest work. Finally, his arm muscles and jaw muscles grew so weak he was unable to lift food to his mouth or to chew solids.

Puzzled physicians called in specialists. They diagnosed the trouble as a rare disease known as *myasthenia gravis*. In it, the muscles retain their outward appearance of vigor but do not respond normally to the messages relayed from the brain.

Recoveries—miraculous, but unfortunately temporary—have been reported by a nerve specialist abroad. He has developed a complex chemical compound for injecting into victims. Within five minutes, they begin to recover the use of their muscles. The effect, however, wears off in seven or eight hours.

On the south coast of Ireland, a few years ago, an even queerer case baffled doctors for several weeks. One Thursday morning, a small boy in Fivemiletown, County Tyrone, came down with a high fever. By afternoon, it reached 105 degrees. The next day, his temperature had subsided. But, exactly one week later, the fever returned, ran its one-day course, and again subsided. Week after week, as Thursday morning came, the child developed a burning fever that rose to 104 or 105 degrees before the day was over. The rest of the week, his temperature was nearly normal.

Newspapers featured the curious case of the "Thursday-fever boy." Doctors were at a loss to solve the riddle, and scientists in all parts of the British Isles engaged in heated debates as to the cause of the strange disorder. Then, a Belfast pathologist studied a drop of the boy's blood under a high-powered microscope and was able to put his finger upon the curious solution of the baffling mystery.

A few weeks before his first attack of fever, the boy had been nipped on one foot by a rat caught in a trap. He was suffering from a rare disease known in the Orient as rat-bite fever. Before the World War, no cases had been reported in Europe. Since then, two or three instances have come to the attention of medical societies.

Another rare infection from the Orient recently traveled to Passaic, N. J. It came on the blade of a Malay creese, or serpentine-bladed dagger. A returning traveler brought the weapon from a temple in Bali as a present for his fourteen-year-old grandson. On the first day, the boy scratched his leg with the tip of the blade. Almost immediately, a mysterious infection of a rare gas-producing germ began to act. The leg swelled as though it were being inflated with a bicycle pump. Only quick work and special treatment at the hospital enabled doctors to conquer the mysterious trouble.

On a number of occasions, patients have had their whole bodies swell up





# A Physician Conducts You on a Tour of the Dim Borderland of Medical Knowledge, Where Weird Maladies Sometimes Defy Diagnosis

By FREDERIC DAMRAU, M. D.

## THESE CASES KEPT DOCTORS GUESSING

- 1 An Illinois woman suffered an attack of yawning that lasted more than a week. Unable to stop, she yawned eight to twelve times a minute, day and night.
- 2 A Negro was attacked by vitiligo, a little-known disease that destroys the pigment of the skin. When the disease had run its course he was completely white!
- 3 A man took on the appearance of an ope. Page's disease, a gland malady, caused this grotesque change in his body structure.
- 4 Worn out by an attack of hiccoughing, a California youth tried to shoot himself. Just as he pressed the trigger, a hiccough spoiled his aim and saved his life.
- 5 In a theater in England, a man was lighting a cigarette when there was a burst of flame. A disorder had made his breath inflammable, and it exploded.
- 6 A Los Angeles boy has red hair on one side of his head; blond on the other. Also, one of his eyes is brown; the other is blue.

like balloons. One instance of the kind occurred at Portland, Ore., only a few weeks ago. In an automobile crash, a man injured his frontal sinus, the cavity above and behind the eyebrows. Air breathed through the nose filtered into the body under the skin. Enormously elastic, the skin stretched until the man was twice normal size, and his neck was puffed out until his chin had disappeared. Actually afraid their patient would swell up until he burst, the doctors punctured him with hollow needles and let him shrink back to normal proportions while they treated the damaged sinus.

A medical riddle which has had French physicians in a certain part of Brittany baffled for more than a decade was recently solved by a special committee of the Academy of Medicine. The doctors had noted with alarm a rising tide of mysterious lead-poisoning cases. They blamed the pipes which carry the drinking water. But similar lead pipes are used in Paris and no trouble results. The committee journeyed to Rennes and investigated.

Paris water, it found, contains lime which coats the inside of the pipes and protects the water. The drinking water at Rennes and other Breton cities, on the other hand, has little lime and contains an acid which eats away the pipes and causes the lead to be carried in solution in the

water. Simply by dissolving chalk in the Rennes water supply, the scientists propose to coat the inside of the pipes and eliminate the source of the poisoning which, for years, has puzzled the Breton medical men.

The strangest poisoning case reported in recent years, caused the death of Sergeant John Wolfe of the Boston, Mass., police force. In line of duty, Sergeant Wolfe had survived being bitten by a cat, a dog, and an intoxicated man. Then, he bit his own tongue and died of septic poisoning!

Another class of stranger-than-fiction ailments are those which cause changes in the color of skins and body tissues. Legs that turn blue, eyeballs that become permanently black, skins that shift their hue to purple, green, yellow, red, black, and brown—are all known to the medical world.

A woman with a rainbow skin, which changed its hue four times in a single week, recently astonished doctors at a Kansas City, Mo., hospital. She was admitted with a light blue skin. Two days

later, it was purple. Then, it became claret red and finally brown. She told the physicians that she felt as though she had a bad case of sunburn, and her temperature fluctuated from day to day, frequently reaching 102 degrees. The unusual case baffled the doctors. The only theory they could advance was that the phenomenon was some sort of drug rash. However, the patient could not recall taking any medicines just prior to her attack. So the cause of her chameleonlike changes of color remains a mystery.

A curious disease that turns the legs of young girls blue is known to the medical profession by the tongue-twisting scientific name of *Erythrocyanosis crurum puellarum frigida*. It affects the arteries, slowing up the circulation in the legs so that the bluish-looking blood in the veins accumulates. Recently, two Manchester, England, surgeons were successful in relieving the condition by operating on nerves which run to the leg arteries that are affected.

In the same country, "a man who was turning to silver" received special study from medical men, a few years ago. For twenty years, he had worked in a plant which makes silver nitrate, important in photography and medicine. Dissolving the metal in strong nitric acid is the initial step in producing the crystals. Bubbles of hydrogen gas rise to the surface during this process, burst, and create a fine silver spray. For two decades, the unfortunate workman had been breathing billions of tiny droplets of this spray. The accumulating silver salts in his system finally turned the whites of his eyes dark gray and black.

Finally, a blood clot in an intestinal artery, believed to have been caused by silver deposits on the arterial walls, resulted in this strange patient's death.

I remember one patient of mine who turned as green as grass following an attack of gallstones. Another with pernicious anemia became the color of a lemon. And a third, a brunette attacked by the little-known and baffling disease, vitiligo, appeared to be half white and half Negro.

This malady, in some mysterious manner, destroys the pigment in the skin. It starts in spots, and spreads. At one stage, the back of the victim, with its irregular patches of light and dark skin, has the appearance of a map. Aside from the loss of pigment, the disease produces no ill effects. So far as can be determined, victims are as healthy after the attack as before. In one remarkable instance, reported by an eastern skin specialist, a Negro was attacked by vitiligo and, when it had run its course, his skin was permanently white!

Devonshire, England, Hartford, Conn., and Los

(Continued on page 107)

## PUTS POPULAR SCIENCE ON THE SCREEN



Jerry Fairbanks, producer of "Popular Science of the Screen," with his photographic truck

MANY readers of this magazine are enjoying the thrilling dramatization of its contents in "Popular Science of the Screen," shown in theaters throughout the country. The picture above introduces Jerry Fairbanks, producer of the "Popular

Science" films and an assistant, on a picture-taking expedition. The photographic truck is packed with the latest in sound- and color-movie equipment, and provides two platforms, one on the roof and one at the side, to serve as points of vantage.



Headlamp with attachment of spiral vanes that breaks up and diffuses the rays of light

### HEADLAMP ATTACHMENT ELIMINATES GLARE

SLIPPED over the bulb of an automobile headlamp, a new attachment is said to prevent objectionable glare. Metal strips, fastened together in the form of spiral vanes, give a springy grip that holds the device firmly in place. The strips serve as reflectors to break up and diffuse the light so that it is evenly distributed over the entire width of the road ahead, instead of being concentrated in glaring beams which "blind" oncoming drivers.

## BIG BUILDING IS SHIFTED FIVE FEET

HOW to get a fourteen-story building out of the way of a widened street was a problem that recently confronted Los Angeles, Calif., engineers. One possible solution was to tear down the face of the structure and erect a new face five feet back, but this plan was discarded as too expensive. Instead, workmen amputated a five-foot section from the middle of the building. The front part, left intact and heavily braced, was then slid back to close the gap. Riding along a track of railroad rails and steel rollers, the building completed the journey without mishap.



Building with a five-foot slice cut out, before front half was shifted back. At left, underpinning on which the fourteen-story section was moved



Wooden blocks, set with bullseye reflectors, shine in light to mark drive

### EDGE OF DRIVE MARKED BY REFLECTOR BUTTONS

TO MARK the borders of a driveway, self-illuminating markers have been devised, consisting of white-painted wooden blocks anchored securely in place with long metal spikes. Each end of the block carries a red bullseye reflector that shines brilliantly in the rays of a car's headlamps. Driving to or from his garage at night, a motorist thus has his path plainly illuminated for him.

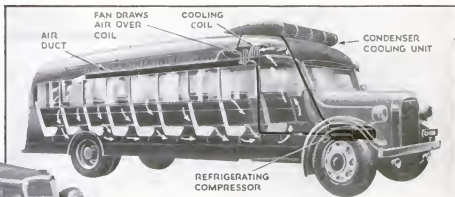
### FAKE WELL TESTS PUMPS

RESEARCH ENGINEERS of a large refining company have built a 150-foot well into which they put oil. Then they pump it out. The procedure tests new types of pumps. By applying back pressure, conditions in wells up to 5,000 feet deep can be simulated.



# Autos Get All-Year Air Conditioning

Below is a test car equipped with a new all-year-round air-conditioning system. The object on the roof is a condenser coil that cools the refrigerant. At right, how system would be applied to a bus



**M**OTORING comfort the year around is promised by a new air-conditioning system for private cars, taxis, and busses, successfully tested by a leading manufacturer and expected soon to be on the market. In summer, a refrigerating compressor coupled to the engine cools the air in the car, and in winter a heating coil warms it. A small fan serves to circulate the conditioned air throughout the vehicle.

## NEW RADIO TUBE CUTS DOWN NOISES

By COMBINING many stages of amplification in a single unit, a new radio tube invented by Dr. V. K. Zworykin, of the RCA-Victor Company, minimizes background noise or artificial static. One tube of the new type, it is predicted, could replace all the tubes in a conventional radio receiver. Improving television images will be its first application.

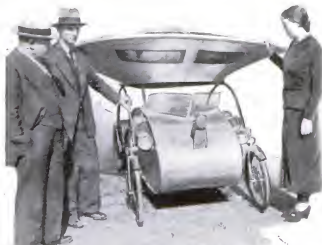


## MECHANICAL WALKER TESTS SHOE SOLES

To TEST the wearing quality of shoes, the U. S. Bureau of Standards at Washington, D. C., has developed the novel appliance shown. Eight shoes at a time may be fastened upon a revolving wheel, which scuffs them along the abrasive surface of an endless belt with a motion similar to a walking step. After a number of revolutions, equivalent to months of wear, the shoes are removed and their soles examined to see how each has fared.



This machine wears eight shoes and walks them over an abrasive, endless belt to test the relative wearing qualities of the soles



## NEWS CAMERAS FILM THRILLING RESCUE

**N**EWREEL men recently witnessed an unscheduled drama as flames ended the attempt of Constantinos Vlachos, co-inventor of one of the strangest of flying craft, to win government aid for its development. He

had planned an ascent from the lawn of the Congressional Library at Washington, D. C., to demonstrate his "triphbian," shown at left, which he claimed could navigate in the air, on land, or in the water. Hardly had he started the motor when fire enveloped the machine. Spectators dashed to his aid and dragged him, severely burned, from the blazing wreck.



At top, odd plane before test. Above, policeman rushing to rescue pilot as craft catches fire

Bystanders attempting to extricate the inventor as flames rapidly envelop the strange machine

Safely removed from the wreck, the creator of the "triphbian" watches its final destruction

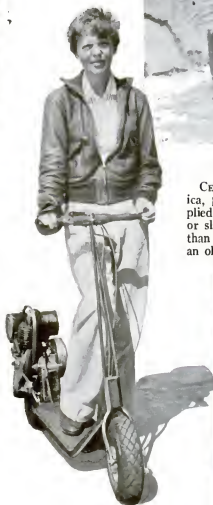




## FIND HELICAL GEAR USED 800 YEARS AGO

CENTURIES before Columbus discovered America, primitive engineers had discovered and applied the principle of helical gears, whose spiral or slanting teeth transmit power more smoothly than ordinary straight gear teeth. In the ruins of an old Swedish castle recently was found a huge

helical gear wheel cut from solid stone, probably one of a gear train used to drive a community grain crusher 800 or 900 years ago. Considerably thicker at the hub than at the rim, to give adequate bearing area, it shows a surprisingly clear idea of gear design for so early a period.

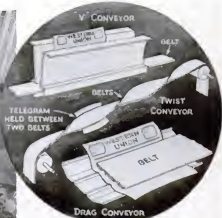


## GASOLINE ENGINE DRIVES SCOOTER

GASOLINE-POWERED scooters have made their appearance, and the picture above shows Amelia Earhart, leading woman aviator, with one that she uses at the Union Air Terminal, Burbank, Calif. The odd vehicle rides on miniature pneumatic tires, and a one-cylinder gasoline motor at the rear propels it at a speed of fifteen miles an hour.



Telegrams being routed through a Western Union central office on a V-type conveyor. Drawing shows this and other types used



## BELT CONVEYORS SPEED TELEGRAMS

TELEGRAMS now speed through Western Union central offices without the aid of human hands, and as rapidly as 1,200 feet a minute, on ingenious new types of belt conveyors. The V type illustrated serves for carrying messages on horizontal runs. For vertical traffic, rubber strips on the drag-conveyor belt pull the message along. Overhead runs are made on a twist conveyor, where a pair of belts carry a message.

## VEST-POCKET RAZOR HAS NO HANDLE



Hinged tabs, attached to the blade holder, take the place of the usual handle in this folding razor designed for travelers

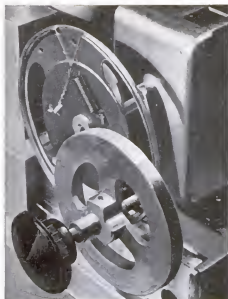
So SMALL that it may readily be carried in a vest-pocket, a folding safety razor for travelers has no conventional handle. Instead, it is grasped by a pair of hinged tabs attached to the blade holder. The one-piece razor uses standard blades, may easily be washed and dried, and has no loose parts that may be mislaid.



## BARBERS' SCISSORS SILENCED

PATRONS of barber shops will miss the familiar clicking of the scissors, if a noiseless type, recently invented for tonsorial use, finds favor. The silencing device is a curved shock-absorbing wire of spring steel, mounted in such a way that it comes between the finger loops as they close and muffles their sound.





### HEAVY FLYWHEEL SPINS RADIO TUNING DIAL

With a "lazy man's radio" of German invention, only a single twirl of the tuning knob is required to change the setting from one end of the dial to the other. A heavy flywheel attached to the shaft of the knob keeps it turning until a desired station is heard, whereupon it is stopped with the touch of a finger. In the picture above, one of the sets is dismantled to show the tuning knob and the flywheel that causes it to spin.



Cabinet of "lazy man's radio." Picture at top shows tuning knob and flywheel that spins it

### GLASSES TINTED AT TOP AND CLEAR AT BOTTOM

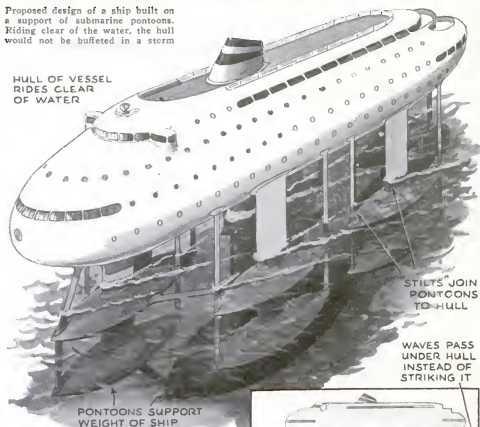
GOGGLES with graduated depth of tint are now on the market for motorists and sportsmen. Dark at the top, to shield the eyes from the glare of sunlight or automobile headlamps, the lenses shade into full transparency at the bottom. They are made by fusing a wedge-shaped section of dark glass to another of clear glass, and grinding the joined sections of glass into a single eyeglass lens.



## SHIP ON STILTS RIDES ABOVE WAVES

Proposed design of a ship built on a support of submarine pontoons. Riding clear of the water, the hull would not be buffeted in a storm

HULL OF VESSEL RIDES CLEAR OF WATER



OCEAN LINERS on stilts are proposed by a Portland, Ore., inventor, to offer travelers safety and comfort at sea. His design envisages a craft supported by buoyant, submarine pontoons, in such a way that the hull itself rides clear of the water. Its elevation above the surface would be sufficient to allow heavy waves to pass beneath it without striking it, eliminating the buffeting to which most ships are subjected in bad weather. Rolling and pitching would thus be minimized. The streamline pontoons are so arranged that they rest in a calm level below the surface layer of disturbed water, and their broad, flattened upper and lower surfaces resist any sudden vertical movement. The propeller is situated nearly amidships, and the tunnel-like inclosure formed by the



BROAD, FLATTENED SURFACES OF PONTOONS CHECK ROLLING AND PITCHING BY OFFERING RESISTANCE TO ANY VERTICAL MOVEMENT. . . .

surrounding pontoons is declared to give high propulsive efficiency. The added weight of the pontoon structure would not be as great as might be imagined, it is maintained, since the elimination of heavy shocks and strains upon all parts of the ship would permit the extensive use of lightweight alloys in its construction.



Graduated-tint goggles in use. They shield a motorist's eyes against glare, while permitting a clear view of the road. At left, pencil shows how the dark section shades into clear glass



### SLIDES CHANGE NEON SIGN

SALES MESSAGES may be varied with a new, changeable neon sign. When its cover glass is removed, flexible slides bearing transparent standardized legends may be inserted, as shown. If he prefers, the user may employ a special frame and fonts of letters and numbers to make up his own signs.

# "Ghost Ship" Radio Station

USES PARTS SALVAGED  
FROM FAMOUS VESSELS

**B**ATTLESHIPS, rumrunners, ocean liners, war-time raiders—all have contributed to the unique amateur radio station of Winton R. Jones, at Baltimore, Md. As an employee of a large ship-salvaging concern, Jones has built his forty-meter station, W3CAQ, from the odds and ends of wrecked and discarded vessels.

His transmitting key came from the S. S. *Jacob Luckenbach*, a liner that went aground on the rocks of the Mexican coast. His antenna wire was once on the U. S. Navy cruiser *Cleveland*; his headphones are relics of a former rumrunner. The socket for plugging them in came from the S. S. *Lenape*, a ship that raced in from the sea and burned in the Delaware River. Even the desk on which his apparatus is assembled is a gift of the ghost fleet. It was originally in the captain's cabin on a U. S. Shipping Board boat which carried supplies to Europe in 1918.

Two lamps which light his instruments rode with Count von Luckner on the *Prinz Eitel Friedrich* when that phantom raider was a constant threat to Allied shipping during the World War. One of his power packs came from the ill-fated *Morro Castle*, the Ward liner which burned off the New Jersey coast in 1934 with a loss of more than 100 lives.

Each of the four meters on his homemade transmitter came from a different ship. Even the brass strips and screws used in mounting the condenser came from wrecked and dismantled liners.

Oldest of the radio relics at W3CAQ is a galvanometer made by the Marconi Wireless Telegraph Company, in England. It came from the S. S. *President Fillmore*, a liner that served as a Red Cross ship during the World War. Material used in a preselector panel was salvaged from an American freighter, the *Transmotor*, whose end formed a ludicrous anticlimax a few years ago. At sea with a cargo of scrap iron, it began to sink, turned back, and was itself cut up for scrap iron at the Baltimore yard!

When Gen. William Mitchell sank the old U. S. battleship *Alabama* with aerial bombs to prove that such craft are obsolete, he supplied Jones with an antenna switch for his station. The dreadnaught lay on the bottom of Chesapeake Bay for several years before it was raised and salvaged.

As soon as a new ship comes into the Baltimore salvage yard, Jones heads for the radio room. The parts he has bought at scrap-metal prices have enabled him to talk with other amateurs in fifteen countries and on five continents.

Winton R. Jones and the amateur radio station he made with parts from wrecked and discarded ships. Even the desk is such a souvenir



This lamp sailed the seas with Count von Luckner in the *Prinz Eitel Friedrich*, famous World War raider

Right, Jones's oldest radio relic, an early galvanometer manufactured by the Marconi company in London, England



This preselector panel was made from parts salvaged from the S. S. *Transmotor*, a freighter that sailed for Europe with a cargo of scrap iron but started to sink and had to turn back and be made into scrap iron itself



The switch shown at the left is a relic of the U. S. S. *Alabama*, an obsolete battleship sunk by Gen. William Mitchell in a test of the effect of aerial bombs on warships. It lay for years on the bottom of Chesapeake Bay



### SAFETY CANE DISPLAYS STOP SIGNAL

POPPING out of a cane like a jack-in-the-box, a red stop sign aids pedestrians in getting through traffic. Pressing a trigger on the cane causes the word "Stop" to appear near the handle, as illustrated above. It rolls back into the cane and disappears when the tip is pressed against the pavement.



Stamp collectors' gauge in use for checking the perforations

### VERSATILE GAUGE CLASSIFIES STAMPS

By COMBINING a perforation gauge, a water-mark detector, a measuring scale, and a magnifying glass, a mechanism recently put on the market saves time for stamp collectors. A knob, moving a rotary gauge, makes possible rapid classification of the perforations according to size and number. A double rule measures the stamps either in inches or in millimeters.



### BUILT-IN PIPE LIGHTER GIVES MATCHLESS SMOKE

MATCHES are unneeded by smokers using a unique new pipe designed by an eastern inventor. Incorporated in the base of the bowl is a small cigarette-type lighter. In use, a striker with a wick is withdrawn from the holder and rubbed against a strip of flint, producing a spark.



### AVIATION FANS PRACTICE FLYING ON A SEESAW

SEESAW "airplanes," that enable beginners to practice piloting without leaving the ground, are being used by members of a flying club in Russia. Riding in cockpitlike boxes at either end of the seesaw, the tyros maintain their balance by movements of a control stick gaining valuable practice that cuts down instruction time later on when they enter a flying school. A third member operates the device from the ground.



Members of an air club in a Russian mining village practicing flying in a crude seesaw with the aid of friends on the ground

### METER TESTS VISIBILITY OF PRINT

How much light do you need to read this page? Special eyeglasses with tiny windows in place of lenses, now give an exact answer to such questions. Twirling a small wheel, the user of the device moves filters across the windows and determines the least amount of light by which he can read a sample of type. Twin, eyebrowlike scales record the relative visibility of the printing and the amount of light the individual requires to read it. Highway signs and signals, as well as printed matter, are being tested by the new visibility meter.



A printed page being tested for visibility to determine the light required for reading it

At left, the meter, with scales that register relative visibility and foot candles recommended



This odd craft, looking like a scow on tractor treads, was designed for rescue work in areas struck by floods or storms



## FLOOD-RESCUE TANK IS AMPHIBIAN

WARLIKE tanks may go to the rescue of people menaced by future floods and hurricanes, if tests of a strange new vehicle, now under way at Lake Placid, Florida, prove successful. Endless treads are designed to propel the twenty-four-foot, amphibian machine over terrain impassable to all other vehicles, and the cleats of the treads will serve as paddles when it takes to the water to cross inundated country. The buoyant, double-shelled aluminum hull of the six-ton ark contains ample space for passengers and supplies. From an elevated cab inclosed in safety glass, the driver controls a 110-horsepower motor mounted in the rear. The "rescue tank" is the creation of Donald Roebbling, a wealthy sportsman.

## POCKET RANGE FINDER GIVES CAMERA FOCUS

USERS of focusing cameras may speedily determine the distance of a subject with an improved range finder, so compact that it may be carried as easily as a pencil by means of a pocket clip with which it is provided. A distinctive feature of the new instrument is a translucent scale, visible through the eyepiece, that enables the distance to be read while still viewing the subject. An adapter enables it to be attached, if desired, to a popular make of miniature camera. The pictures at right show the range finder and the manner in which it is used.



## ELECTRIC GOAD SHOCKS LAZY HOGS OR CATTLE

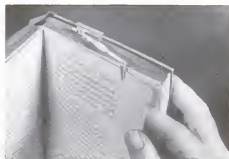
IF HOGS or cattle become reluctant to move along, an electric "persuader," recently devised in Germany for cattle drovers, quickly starts the animals on their way. When the prod is thrust against one of them, as shown above, the pressure on a pair of buttons at its tip closes a circuit and the buttons become electrified, administering a harmless but effective shock. Batteries within the handle of the device supply the current.

## BEER COMES IN NOVEL CONTAINERS

BEER is appearing in a variety of containers, these days, and two of the newest are illustrated at the left. The small one is a tin can with a bottle-cap top; the top may be removed with an ordinary bottle opener, and the can may be thrown away when it is emptied. These small cans can be stored compactly. The larger of the two containers shown holds one sixteenth of a barrel. It is drained with a spigot, and is said to provide all the attractive features of draught beer.



Two new containers for beer. The larger one is drained with a spigot. The small can may be opened with a bottle opener



## AUTOMATIC BOOKMARK

CLIPPED to the back cover of a book, the bookmark shown above automatically keeps the place when the volume is laid down. A hinged metal arm serves as the marker, and its flat tip is shaped in such a way as not to damage the pages. As one leaf is turned, a spring flips the marking arm instantly into place against the next right-hand page.



# Lighting the World's Largest Furnace Fires



Night view of a steel mill in operation. The light at the right is the flare from a blast furnace

**R**ARELY, after it is first lighted, is the fire in a modern blast furnace allowed to die; the expense of the complex procedure of starting the furnace up again compels the foundry operators to keep the fires going constantly. However, the recent industrial depression

made it necessary to kill the fires in some of the largest blast furnaces. Now that they are being started up for production again, the photographer has seized on an opportunity that may not be offered soon again, to make a pictorial record of this interesting phase of the steel industry. He has accompanied the iron workers at a German mill right down into the shaft and followed their important operations from that point on.



This photograph shows men riding a bucket down into the shaft to prepare the furnace for charging. The walls are lined with refractory brick, and the tube at the left carries off gases formed during combustion



One of the huge furnaces in which iron ore is smelted in a German mill. The men wear gas masks



A sample of molten iron, for analysis, being drawn from one of the taps. Each tap is sampled in this manner, as a check on the purity of the iron being produced

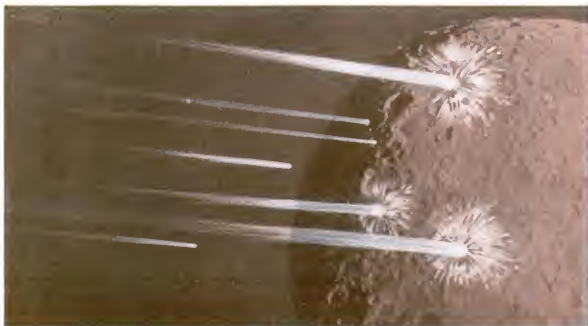


At left, covering the base of the empty furnace with coke, on which will be stacked alternate layers of coke and crushed iron ore. A blast of preheated air forced through the structure ignites the coke. The iron freed by the combustion flows from taps in the furnace, as at right



## THE MOON UNDER BOMBARDMENT

This imaginary view shows a swarm of giant meteors striking the moon and exploding like huge shells. If the "impact theory" is a correct explanation of the lunar craters, our satellite must have undergone many similar cannonades to produce the countless scars which mark its entire visible surface



# Did Exploding Meteors

TESTS WITH LEAD, MUD, AND WATER ILLUSTRATE

**A**LTHOUGH the moon is our nearest neighbor in space, it has given our astronomers one of their most puzzling problems. In spite of the fact that they have mapped every detail of the visible lunar surface more completely even than the earth's has been, they are still in doubt about the forces which created the moon's strange circular pits, com-

monly called volcanoes. It is, however, very easy to show with simple experiments how the moon's face might have received its pockmarks.

Volcanoes they certainly are not—at least, in our earthly sense of the word. Nearly all terrestrial volcanoes rise gradually to a conical peak, in which the crater is higher than the surrounding table-land. Only one or two of our volcanoes (in

Hawaii) have craters below the level of the adjacent land, while on the moon it is the general rule for the circular wall to rise higher above the crater's floor than it does above the surface outside. In other words, a moon "volcano" is a walled plain which is sunk below the encircling land. In addition, the sunken plain frequently contains a high central peak which has no visible suggestion of a lava vent or opening at its summit.

Another point against the volcanic theory is the fact that small craters are frequently seen superimposed on large ones, often in the circular wall itself. An example of this is shown in an accompanying photograph. So the theory that the moon was pock-marked by enormous volcanoes is now generally abandoned.

This theory has been replaced by several others, the chief of which supposes the craters to be the bullet marks or shell craters left by the impact of enormous

## MOON CRATERS IN MINIATURE

By dropping marbles into soft mud, you can form perfect little copies of moon craters, even to the central peak as indicated by pencil below. Compare them with the real one in circle





By  
GAYLORD  
JOHNSON

#### WHERE A METEOR STRUCK THE EARTH

The famous meteor crater near Winslow, Ariz., as seen from the air. This mile-wide hole is small as compared with the huge depressions on the moon

# Dig the Moon's Craters?

## A POSSIBLE ANSWER TO A RIDDLE OF ASTRONOMY

meteors. This impact theory has one very striking advantage. It works when demonstrated experimentally. You can test it yourself in several simple ways.

First, if you have a revolver, you can fire a bullet at a block of lead which is too thick to be penetrated. You will find that the bullet has formed a crater in the lead which has the characteristics of a typical moon crater. You will find the circular wall of lead higher above its center than above the surrounding surface and, most interesting of all, the bullet dent will have a peaklike elevation in its center. This experiment certainly suggests that the moon has had a barrage of stupendous bullets fired at it.

A still more interesting experiment can be performed with a bowl filled with thick but semiliquid mud. It should be liquid enough to splash quite easily when a marble is dropped into it but thick enough to retain the shape of the depression formed by the impact. I prepared mine by gradually adding and stirring water into a mass of soft modeling clay until the right consistency was obtained.

WHEN a marble, or small ball of clay, is dropped into the mud from a height of a yard or so, the depression left after the ball has plunged beneath the surface will strongly resemble a typical moon crater—even to the conical peak forced up in the center. Several of the artificial craters formed by dropped marbles are shown clearly in one of the accompanying photographs. When the light from a flash light is thrown across them from the side, their appearance is almost exactly like that of the moon craters seen along the sunrise or sunset line on the moon, when sunlight throws them into sharp lights and shadows.

It may be objected that this experiment deals with soft mud, which can be made to splash easily, while the moon's surface is firm rock, probably about the density of pumice stone. Would the impact of a celestial projectile throw up solid rock into a mountain ring 20,000 to 30,000 feet high, at the same time incising a central peak perhaps 10,000 feet high?

The answer to this is that the energy released by the collision of an enormous meteor with the

#### WATER-DROP CRATERS

Movies of a drop falling into a pan of water show how it first pushes up a crater, then recoils to form a peak



In the photo-diagram at the left, above, our artist has reproduced the appearance of erupting sun-spot storms on the sun. Some astronomers believe the moon was once a tiny sun and that its craters and radiating "rays," seen in photograph at right, are relics of sun spots

# Easy Home Experiments

## DEMONSTRATE LAWS OF PHYSICS



**SEEING ALTERNATING CURRENT.** Connect a neon lamp with an alternating-current circuit and look at the light through a slot in a card which is moved from side to side before your eyes. When the movement is properly timed, you can see each electrode darkened as the current reverses its cycle, and the lamp appears unlit.



### A STUDY IN REACTION

As water flows out of the curved tip of the medicine dropper at the bottom of this apparatus, the rubber tube is pushed away from its vertical position in a direction opposing the flow, following the law that every action causes an equal and opposite reaction.

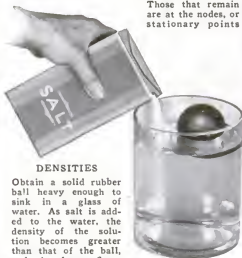
### VIBRATING MAGNETISM

A spool of wire, connected with a lamp on a sixty-cycle alternating-current circuit, transforms a nail placed inside it into a magnet 120 times a second. A stretched iron wire in front of it will emit a musical tone if it is pinched, as shown, at just the right point.



### NODES OF VIBRATION

Not all parts of a vibrating wire are in motion, as you can prove by this simple test. Draw a wire taut as shown above, and pluck it. While it is vibrating, place saddle-shaped pieces of paper on it at intervals. Some will be thrown off; Those that remain are at the nodes, or stationary points.



### DENSITIES

Obtain a solid rubber ball heavy enough to sink in a glass of water. As salt is added to the water, the density of the solution becomes greater than that of the ball, and the latter floats.



**DEMONSTRATING INERTIA.** Cut an apple partly through with a knife and hold it as shown above. By striking the top of the blade sharply with your fist, you can easily cut the apple in two in midair. Inertia, the property by which stationary objects tend to remain at rest, holds the apple still while the blade passes through.



### MAGNET REPELS COIL OF WIRE

When you thrust a magnet into one of the rings of this spectaclelike swing of bare wire, a current of electricity is induced as in a coil. This sets up a mechanical force, and the swing turns in opposition to the force of the magnet.



# Un-Natural History By GUS MAGER

**P**ERHAPS THE STRANGEST, MOST CONTRADICTIONARY ANIMAL THE WORLD HAS EVER PRODUCED, IS THE PLATYPUS OF AUSTRALIA AND TASMANIA. THIS WEIRD CREATURE SPORTS A BILL AND WEBBED FEET (FOREFEET) LIKE A DUCK, THOUGH IT IS CLOTHED IN FUR, LIKE A MOLE!

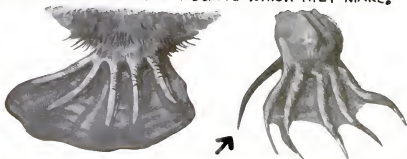


THE PLATYPUS LAYS EGGS (RIGHT) LIKE A TURTLE'S YES, SOFT-SHELLED EGGS, JOINED IN PAIRS! AND TO FURTHER MESS UP NATURAL HISTORY, THIS FREAK ANIMAL BROODS IN A NEST LIKE A SELF-RESPECTING FOWL!



AS THE PLATYPUS SUCKLES ITS YOUNG, IT IS, AFTER EVERYTHING'S SAID AND DONE, A SURE-ENOUGH MAMMAL!

ON THE HIND FEET OF THE MALE PLATYPUS ARE CURIOUS HOLLOW SPURS, CONNECTED WITH GLANDS NEAR THE ANKLES, WHICH ARE SUPPOSED TO CONVEY POISON INTO THE WOUNDS WHICH THEY MAKE!



IN THE LIVING ANIMAL, THE SCHNOZZLE PRESENTS A VERY DIFFERENT ASPECT FROM THE BLACK, DRIED, OLD-SHOE EFFECT OF THE STUFFED SPECIMEN. THE BILL, IN LIFE, IS SOFT, PINKISH, AND PLIABLE — AND VERY SENSITIVE!



THE NEST IS REACHED THROUGH AN UNDER-WATER TUNNEL

**Y**OU may be a mathematician and know your figures when you see them, but the almost unbelievable figure of the Australian duck-bill, or platypus, has flunked the ablest naturalists and scientists of the world, ever since the screwy little animal was first discovered. Combining the better-known features of fowl, fish, and mammal, it can hardly be described otherwise than as a platypus. Because of its extraordinary shape and singular habits this little creature—hardly more than twenty inches long—has aroused more interest than animals that are a dozen times its size.

# Newest Inventions FOR THE HOUSEHOLD



## BOOKLIKE ASH RECEIVER

Masquerading as a handsomely bound volume, this novel receptacle contributes to the neatness of the living room by relieving congestion in the ash trays. A slight pressure of the thumb raises the decorative cover, as illustrated

## SOAP COMES IN TUBES

Toilet soap in paste form, packed in individual tubes, is now offered as being more sanitary and more economical than the conventional cakes. In use, a little of the paste is squeezed onto the hand, as shown below. Rubbing with a little water quickly produces a thick lather



## BATHTUB-LEVEL ALARM

A float, sliding up a rod in the device at the right, causes a bell to ring when the water level reaches a predetermined point. It can also be adapted to other uses



## BREAD KNIFE HAS THREE BLADES

A loaf of bread can be sliced quickly and evenly by the use of the three-bladed knife illustrated above. The three stainless-steel blades are attached rigidly to a single handle, and a finger rest on one side makes it easy for the user to produce straight slices



## SOAP BALL FOR SHOWER

Strung on a heavy cotton cord, the ball of soap shown at the left is worn around the neck in the shower bath, and is always handy for use



## COMBINATION NIGHT LIGHT

The novel flash light pictured below is turned on by lifting the luminous glass dome. A single bulb supplies a diffused light from the dome and a concentrated beam from the base



**BOTTLED ICE COOLS DRINKS.** To cool beverages without diluting them, this triangular glass tube is filled with water and frozen solid in the refrigerator. It can then be placed in the beverage, or used for stirring and cooling it



#### NOVEL DESK LAMP HAS THERMOMETER

Combining a memo pad, thermometer, and desk lamp, the unit shown at the left is an appropriate fixture for a man's study or office. The needle-type thermometer is mounted in a panel which forms the base of the lamp, while the large memo pad has a rack for a pen or pencil



**SWEEPS UNDER BEDS.** The jointed handle of this new carpet sweeper makes it possible for the housewife to sweep under beds and other furniture without stooping. The joint can be locked in position and a center-attached bail prevents nicking furniture by striking it



**CLIP-ON COASTERS.** Individual pads of blotting paper that clip onto the bottoms of cocktail glasses are the latest device to protect tables from dripping or sweating glasses. The base of a stemmed glass is slipped under tabs on the coaster, as shown in the picture above



**HANDY BATHROOM CABINET.** Combined with the wash basin, the cabinet illustrated above and to the left provides a storage space at the top, a conventional medicine cabinet, shelf for soaps, rack for towels, and, at the bottom, a soiled-clothes hamper

#### IRON KNOWS WHEN WAFFLES ARE DONE

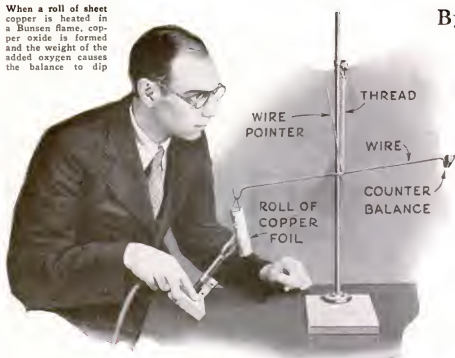
When the top of this electric waffle iron is raised, the waffle is lifted off the grid. A switch can be set to turn off current when waffles are as crisp as desired



# Tests *with* COPPER

By Raymond B. Wailes

When a roll of sheet copper is heated in a Bunsen flame, copper oxide is formed and the weight of the added oxygen causes the balance to dip



ly, called verdigris. True verdigris is formed from copper and acetic acid, and may be made in the home laboratory by leaving a strip of copper immersed in vinegar for several days. You may also find it interesting to test the effect of treating copper with other household compounds such as ammonia water and soda. The blue or green colors usually obtained are typical of most compounds of copper.

Experiments in which copper is made to combine with chlorine make interesting laboratory demonstrations. One way to do this is to hold a copper wire, which should be thick enough not to melt, in the flame of a Bunsen burner, while a cotton wad soaked with carbon tetrachloride is held near the air inlet at the burner base. Vapors carried up into the flame are decomposed by the heat and release chlorine gas. As the chlorine reacts with the copper, forming chloride of copper, and the latter in turn breaks down into copper and chlorine again, you will observe a beautiful blue glow about the wire.

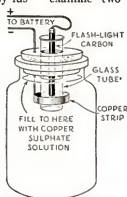
Copper combines with sulphur at a relatively low temperature. This you can show by brightening several short lengths of copper wire with emery cloth or sandpaper and placing them in a test tube together with powdered sulphur. Set the test tube in a beaker of water to which a considerable amount of salt has been added. This

**H**AVE you ever seen what copper really looks like? To appreciate the beauty of its pale, rosy luster, you must scrape it, or clean it chemically, as by heating it until red-hot in a stream of hydrogen gas. Otherwise, its true appearance is masked by the surface coatings that copper readily acquires, because of its chemical activity, through interaction with substances in the atmosphere. Even a freshly polished surface of copper quickly darkens, on contact with the air, to a dull bronze hue. Eventually through weathering, it takes on a greenish color such as you may see on copper roofs, gutters, and drainpipes.

When an electrician scrapes copper wires bright, before joining them, he is removing a film of copper oxide. Oxygen from the air has formed this surface coating by combining with the copper. Since the oxygen is still there—and since oxygen has some weight, even though it is normally a gas—you would expect that the copper would get heavier in the process. An interesting experiment will show that this is a fact.

Suspend a piece of stiff wire, with ordinary sewing thread attached to its middle, to serve as the crossbar of an improvised balance; and provide it with a wire pointer. Hang a roll of sheet copper on one end of the arm and place a small weight at the other end to balance it. After you have adjusted the pointer to rest, heat the roll of copper for several minutes with your Bunsen burner. Oxygen from the air will combine with the copper, forming copper oxide upon it, and the increase of weight will be shown by the fact that the balance dips toward this side.

Scrape the scales from the surface of the copper sheet and you will be able to examine two different kinds of copper oxide.



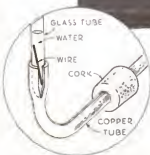
Details of simple electrolytic cell for showing movement of copper ions during electrolysis

The black deposit on the outer surface of the scales consists of a substance known as cupric oxide. The inner surface of the scales, however, consists of another compound called cuprous oxide, which is brown in color. Cuprous oxide contains less oxygen in proportion to copper than cupric oxide, to which it may be converted by further heating in contact with the air. When a sheet of copper is held in a Bunsen flame, the formation and destruction of these oxides

produces beautiful iridescent colors.

The light green coating that copper acquires on exposure to the weather is a complex variety of copper carbonate, formed by the action of carbon dioxide and moisture in the atmosphere. Appearance of this kind of "rust" upon a roof or gutter need cause no concern. Once formed, as a matter of fact, it constitutes an impervious armor that protects the metal beneath it more effectively than any paint could do. Copper coins and statues covered with this green patina have been found undamaged after having lain in damp earth for centuries while iron objects similarly buried have long since crumbled into rust.

In popular language, the green coating upon weathered copper is often, and erroneously,



## HEAT CONDUCTIVITY

This experiment demonstrates the amazing efficiency of copper as a conductor of heat. The water in the glass tube is boiling as the result of heat being carried to it from the Bunsen burner by the copper tube. Drawing at left shows the apparatus



# in the Home Laboratory

*By Its Unusual Activity This Metal Provides  
Many Striking Experiments for the Amateur*

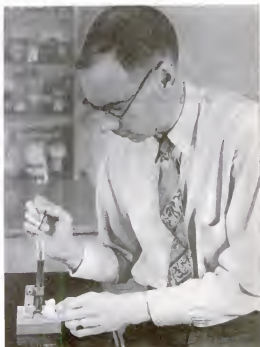
forms a brine solution with a higher boiling point than that of pure water, enabling it to be raised to a temperature of 115 degrees C. or more. Boil the brine solution for several minutes. Examination of the contents of the test tube will then show that a reaction has occurred between the sulphur and the copper, as evidenced by the discoloration produced. The simple device used in this experiment to control the temperature is known as a water bath. Higher temperatures may be imparted to substances under test if oil is substituted for the brine solution.

As you have seen in the case of the oxides, copper can combine with other substances, in two different proportions, forming "cuprous" and "cupric" compounds. Solutions of cupric salts are characteristically blue in color, in contrast with the colorless solutions formed by soluble cuprous salts. Compounds of either type can easily be made in your own laboratory for use in a number of experiments.

If you dissolve metallic copper or black copper oxide in hydrochloric acid, and evaporate the solution in an ordinary evaporating dish that is open to the air, you will obtain green crystals of cupric chloride. Considerably more metal or oxide than acid should be used. You can also prepare cuprous chloride from copper and hydrochloric acid but in this case air must be excluded. Place some hydrochloric acid and some scraps of copper, such as a loosely wound ball of copper wire or a piece

of copper fly screen, in a glass flask. Provide the flask with a stopper that is fitted with a glass tube a foot or two long. This arrangement will permit the vapors to escape but will keep air from entering while the solution is being heated. It will also trap escaping liquid, allowing the drops to fall back into the flask.

Boil the liquid until it becomes colorless, showing that the cupric chloride initially formed is no longer present. It has all been converted into cuprous chloride. At this point there should still be



A copper wire is held in a burner flame, while a wad of cotton soaked in carbon tetrachloride is placed at the air intake. Chlorine gas, released by the flame, reacts with the copper

Copper-ammonium chloride crystals being wrapped in decorative transparent material for use in a fireplace to produce beautiful, colored flames

some copper metal remaining in the flask. Allow the liquid to cool a little, and then pour it into a quart or more of cool water that has previously been boiled. The white precipitate that forms consists of cuprous chloride and may be filtered off, dried rapidly at a moderate temperature (about the boiling point of water), and kept in a tightly stoppered bottle. If the hot acid solution is thoroughly cooled by itself, instead of being poured into water, white cuprous chloride crystals will be obtained. Since hydrochloric acid gives off acid fumes when it is heated, this step should be performed out of doors, or the glass tube used with the flask should be provided with an extension leading to an open window.

The cuprous chloride you have made can be used as a temperature indicator, for it turns from a white substance into a dark-colored one when it is heated. The change occurs well below its melting point of 421 degrees C. It has been suggested that this substance, applied to machine bearings, would indicate whether they are "running hot" and need oiling.

Dissolving either cuprous or cupric chloride in ammonia water or ordinary household ammonia yields a deep-blue solution. When the solution is allowed to evaporate, crystals of a complex copper-ammonium

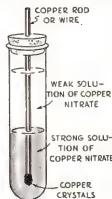
chloride are obtained. Placed in a log fire, these crystals will give a vivid display of colors and they may be done up decoratively for this purpose in colored, transparent wrapping material.

Removing soot from chimneys is a curious use to which cupric chloride may be put. Since soot consists principally of carbon, it would theoretically be possible to remove it by burning it off with the aid

of heat and oxygen. But such a process would be disastrous, because of the high temperatures involved. If cupric chloride is thrown on a briskly burning fire, however, the chemical is carried up the chimney and lowers the temperature at which the carbon will combine with the oxygen in the air, through a process still little understood. This will help to clear a chimney that does not draw well. Zinc oxide has a similar effect and, for this purpose, the usual practice is to throw zinc metal, as from a dry cell, on the fire. As the metal burns, the oxide goes up the chimney and coats the soot, assisting

in its destruction.

The blue color characteristic of solutions of cupric salts is due to the presence of cupric-type ions, or particles, of copper. This can be shown by passing electricity through *(Continued on page 103)*



Copper crystals form on the end of a wire or rod of copper in the experiment above



HANDY HEAT-INSULATING MAT

Asbestos pads, of the type sold for use in the home, make excellent heat-insulating mats for the home laboratory. In the photograph above, such a pad is seen in use under a flask into which a hot liquid is being poured. This is an example of the way in which many common articles, obtainable at low cost, can be adapted to the needs of the amateur by the use of imagination

# Radio Burglar Alarm



The front door can be protected by fastening the detector wire to the lock. Anyone approaching the lock sets off the alarm.

**N**EITHER craftiness, jimmies, nor gum-soled shoes will help the prowler who tries to enter a home protected by this novel radio burglar-alarm system. He may not pick a lock nor force a window, yet his unwanted presence will trip the sensitive circuit that sounds the alarm.

Operating on radio-receiver principles, the circuit is as easy to construct as the simplest one-tube set. In fact, its type '76 tube, plug-in coils, and variable condensers make the completed outfit look very much like a small short-wave receiver. The parts, all standard, can be purchased from any radio dealer for a total of about seven dollars.

In use, the alarm system consists of three units—an electric vacuum-tube circuit and relay, a battery-operated gong or bell, and a concealed detector wire. The actual circuit, housed in an aluminum cabinet, can be hidden in a drawer or closet. Only one thing determines its location; it must be near an electric outlet, since it is operated by 110 volts either direct or alternating current. The alarm gong can be installed almost anywhere, preferably at some distance from a window or outside door.

In placing the detector wire, the home owner will have to use ingenuity. Where it is placed will depend to a great extent on the construction of the house. The obvious points of entry should be protected. It can be concealed around windows and doorways, connected to the front-door lock, or wired to a rectangle of wire screening concealed under a rug or front-door mat.

Since the alarm will be sounded when anyone approaches within a few feet of the detector wire, it can be completely concealed in the woodwork or under rugs,

upholstery, and tapestries. Once the experimenter understands the inner workings of the circuit, he should have little difficulty in placing the detector wire to best advantage.

First of all, the type '76 tube is the key to the circuit. Connected as shown in the schematic diagram, it operates an electric relay which closes the alarm circuit and rings the gong. In use, the capacity of the entire circuit, including the detector wire, is adjusted by means of the two variable condensers in such a way that the tube is just on the verge of oscillating. So long as the circuit remains in that condition, the relay remains open. Now, suppose a burglar enters

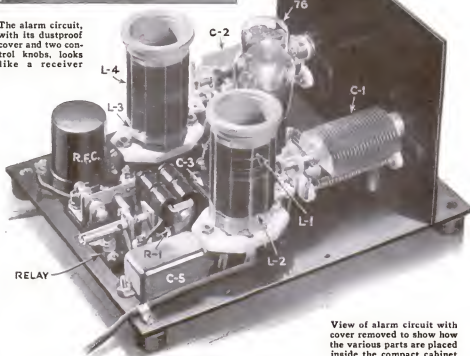
through a doorway or window protected by the circuit. To do so he must come within a few feet of the detector wire concealed in the woodwork. His presence near the wire adds more capacity to the circuit, upsets the sensitive balance, and immediately the tube begins oscillating. This in turn cuts off the current to the relay, closes the gong circuit, and rings the alarm bell.

Technically, this is what takes place: During one half of each cycle, the oscillations cause electrons, tiny particles of negative electricity, to accumulate on the grid of the tube and on one plate of the grid condenser ((C3). During the next half cycle, the oscillation is reversed, but the electrons already accumulated on the grid are trapped and cannot escape.

This is repeated with each successive cycle and as the accumulation of electrons (negative electricity) increases, the voltage of the grid becomes more and more negative. Eventually, the grid of the tube becomes so heavily loaded with the negative charge that the positive voltage on the plate is neutralized and the plate current drops to zero. This cuts the current off from the



The alarm circuit, with its dustproof cover and two control knobs, looks like a receiver.



View of alarm circuit with cover removed to show how the various parts are placed inside the compact cabinet.

# Easily Built with Receiver Parts

relay, deenergizes the magnets which release the relay armature, and allows it to close the battery circuit to the gong. This, of course, all takes place very rapidly, the actual time required being less than one ten thousandth of a second.

Since the operation of the circuit depends entirely on balance, it is obvious that good insulation and low-loss construction are important. The sockets used for the tube and coils particularly must be of the heavily insulated type. Likewise, the condenser should be of the variety mounted on slabs of low-loss insulating material. Under no circumstances alter any of the specifications. They were chosen only after several months of experimentation.

The two coils required are of the standard six-prong, plug-in type having three windings on each form. As only two windings are required on each coil, the tickler can be removed from one and the primary winding from the other. The remaining windings are indicated on the diagram. Since the primary and tickler coils in each case are silk-covered wire, they can be identified easily.

A good grade of mica condenser should be used for the grid condenser (C3). Its outer covering should be well insulated.

Any sensitive relay that will operate between one and ten milliamperes current can be used as the control unit in the system. By shopping around, relays of this type can be obtained for less than a dollar.

Although the placement of parts and general layout of the circuit is not critical, the experimenter, particularly the novice, should not attempt any radical changes. In the original, the base and front panel were cut from sheet composition although a baseboard of wood would have served equally well. Since the circuit must be stable, it is important that all parts be mounted rigidly to prevent shifting.

Wiring throughout should be from point to point and heavy, solid bus-bar wire is preferable to flexible wire. Make good firm soldered connections and pay particular attention to the soldered con-

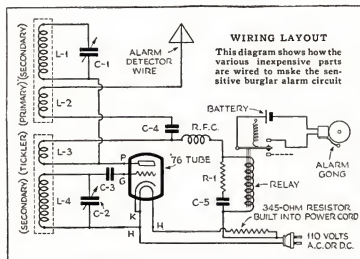
nections in the tuned circuit. Any resistance introduced here will result in a loss of sensitivity.

**TO TEST** the alarm, adjust both tuning condensers for minimum capacity and grasp the detector wire in your hand. Rotate the tuning condenser C1 slowly until the relay deenergizes. A click will be heard when this takes place, indicating that the spring has pulled the armature over to the contact that closes the gong circuit. Finally, turn the condenser back a bit and repeat the process. The two condensers should be so set that the relay just trips when your hand is brought near the detector wire.

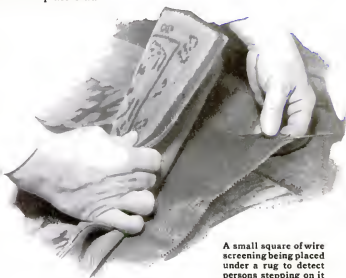
If a 0 to 10 millimeter meter is available, extremely fine tuning can be obtained. With the meter inserted in the plate lead

the condensers should be adjusted to give the lowest possible reading without tripping the relay. With either method, a certain amount of experimenting will be necessary to balance the circuit at such a point that a hand brought within a few feet of the detector wire will sound the alarm. The best adjustment will be quite critical, due to the extreme sensitivity of the circuit.

Naturally, as with any burglar alarm, periodic inspections and tests should be made to check the sensitivity. Should the circuit get out of order or the power fail, however, the alarm will sound automatically. It likewise will sound if the burglar cuts the [\(Continued on page 109\)](#)



When the detector wire is strung around a window, as shown, any intruder sets off the alarm



A small square of wire screening being placed under a rug to detect persons stepping on it

# SIX NEW HELPS FOR Radio Builders



This soldering-iron rest is clipped to the iron even when it is in use, as shown at the left. When the hot iron is laid down between jobs, the lightweight clip is always in position to hold the hot tip of the iron free of the bench

**INEXPENSIVE** and lightweight, the novel soldering-iron rest shown can be clipped directly to the body of any iron. Once in place it provides an ever-ready support. Also, surrounding the hot body of the iron while it is being used, the clip serves as a guard to prevent loose wires and small parts from coming in contact with the iron and being damaged by its hot surface.



A new one-volt grid-bias cell (in man's hand) is dwarfed by an ordinary flash-light cell

## A Midget Grid-Bias Cell

**SLIGHTLY** larger than a shoe button, the latest in grid-bias cells sets a new record for compactness. Designed primarily to supply voltage for the grid of a type 75 or 2A6 receiver tube, the tiny units can provide a constant potential of one volt almost indefinitely without renewal. When in use, the cells, which consist of an outer negative shell and a positive central disk, are mounted in special holders of the type shown in the picture above. They can be used in either commercial, household, or automobile receivers.



## Flexible Condenser Shaft

**WITH** a new flexible coupling recently placed on the market, it is possible to mount a variable condenser at any angle up to ninety degrees to its control-knob shaft. Special construction practically eliminates backlash and two hubs of porcelainlike material provide perfect insulation. Set screws fasten the coupling to the control shaft and the condenser shaft, as shown in the photograph above.

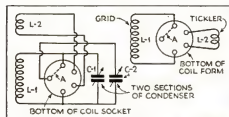
## Divided Condenser Becomes Dual Tuning Unit

**UNFORTUNATELY** a variable condenser which tunes nicely at 200 meters is much too critical at thirty meters. Although it is not practical to change the tuning condenser along with the coils for each wave band to obtain perfect matching, much the same result can be obtained by altering the single tuning condenser to provide two independent tuning units. To do this, it is only necessary to obtain a condenser of the 350 mmf. broadcast type, remove some of the stator and rotor plates at the center, and make a cut in the stator shaft with a hack saw to separate the two halves electrically. Connected as shown in the diagram below, simply plugging in the desired five-prong coil will connect in either one or both sec-

tions of the condenser. If four coils are used, connect the fifth pin on the forms for the lower frequencies as shown by the dotted lines (A) in the diagram. For the higher frequencies no connection to the fifth prong is made.—T. C. Van Alstyne.



With stator and rotor plates removed at the center and the stator shaft cut in two, this 350-mmf. condenser provides two tuning units



## "B" Battery Has Plug Connection

**TO ELIMINATE** the necessity of reconnecting wires when changing batteries, a three-prong removable plug replaces the usual fixed connection clips on the newest "B" battery. The plug which is simply removed when a battery is changed, provides negative, positive 22½-volt, and positive forty-five-volt connections.



A tri-pronged plug replaces clip connections on new "B" battery

## Coiled Spring Makes Handy Connector

**BY MAKING** up loosely coiled springs from scrap wire, the amateur experimenter can provide himself with handy connection clips. Stiff wire wound on a one-quarter- to one-half-inch core gives the best results. The winding can be done by hand or on a lathe. In use, the clips can be mounted on a board or used free as in the photograph at the right. To make a connection, the springs are simply bent slightly. This opens up the coils of the spring sufficiently to take either a wire or a phone tip.



A small, homemade spring clip is used here to connect four lead terminals



**Question:** Aren't half the people on earth upside down?—P. X., Damaguete, P. I.

# Here's the Answer

A.—DOWN is the direction of gravity, or the direction taken by a body when it is free to fall. This direction is everywhere on earth towards the center. In relation to this directional force, no one is upside down and, of course, regardless of location on the earth, each one perceives himself in an upright position.



## The Eagle as Kidnaper

Q.—HOW much truth is there in the stories that eagles have carried off very young children?—B. E. H., Memphis, Tenn.

A.—IT is not likely that an eagle has ever carried off a child, in the opinion of ornithologists and biologists who have made a study of this question. An eagle can lift, according to these scientists, a weight only slightly in excess of its own. The average weight of the bald eagle, the commonest in this country, is eight to twelve pounds. This means that an eagle could conceivably carry off an infant weighing up to fifteen pounds but it is doubtful if such young infants are ever left outdoors unattended. Scientists have never been able to find a so-called eyewitness account of such a kidnapping which would stand up under close scrutiny.

## Clearing Up Amber's Past

Q.—IS AMBER a product of the sea?—Mrs. I. L. B., Louisville, Ky.

A.—AMBER is the resultant product of the action of the ages on pitch or resin exuded from pine trees in prehistoric times. Accumulations of the resin became covered by various layers of soil and by natural forces were changed into their present form. Today most of the amber is mined in East Prussia and along the shores of the Baltic Sea. The notion that amber is a product of the sea comes from the fact that pieces of it are washed up after storms in the North and Baltic Seas. These bodies of water now cover areas which were once pine forests and consequently they probably cover beds of amber today.



## Salamanders Keep Cool

Q.—CAN a salamander actually walk through fire?—H. S. M., New York City.

A.—CONTRARY to a common belief, salamanders have an aversion for anything hot or dry. They are among the animals most tolerant to cold. Salamanders are amphibians and require moisture to live. Some species inhabit cold subterranean streams; others live in the icy waters of mountain streams. They are hardy creatures and their habitat is widespread.

## Where the Grass Grows Tall

L. G. W., RACINE, WISC. There are more than 4,000 species of grass and they are found in all kinds of soil and in all types of climate. The giants of the grasses are the bamboos, some specimens of which reach a height of 100 feet.

## For Dye-Stained Hands

B. D., ST. JOSEPH, MO. Most dye and lacquer stains can be removed from the hands by rubbing with linsed oil—only a very small amount need be used. When the spots have disappeared, without removing the oil, wash your hands in warm water with a good lather of soap.

## That's No Lily

Q.—ARE CALLA lilies cultivated hybrids of the Easter lily family?—L. P., Holyoke, Mass.

A.—CALLA LILIES are not lilies. They are herbs, members of the arum family to which belong such familiar plants as the jack-in-the-pulpit and the "elephant ear" or caladium.



## From the Days of Jolly Tars

D. A. R., WOONSOCKET, R. I. Rosin, turpentine, and certain resinous products came to be known as naval stores in the days of sailing vessels when pine tar was used to

waterproof the ropes, sails, and many other parts of ships.

## It's Like Your Appendix

Q.—WHY do the lapels of men's coats have a V-shaped notch in them?—L. M., Kansas City, Mo.

A.—THE V-shaped cut in men's coat lapels is a survival of a seventeenth-century style. In those days, coats were fastened about the neck and the V-shaped cut was useful in giving the collar a snug fit.

## Lending Millions of Ears

Q.—CAN you tell me how many radio sets are tuned in, on the average, for the evening programs?—N. A. R., Pontiac, Mich.

A.—AN EXTENSIVE survey, made last winter, showed that more than 4,546,000 radio sets were tuned in on the average, between the hours of 7 and 10 P.M. This figure represents over thirty-six percent of the total number of radios in the homes of the country.



## Some Equine Elders

Q.—WHAT was the oldest age ever reached by a horse? Is the animal still alive?—A. S. D., Spokane, Wash.

A.—THE oldest horse on record died at the age of 62. An authentic record of this horse's long life span was kept by the British National Horse Association. The oldest living horse, of which there is a record, is now 48. It is a Shetland pony and is owned by a woman living near Belvoir, England. Other long-lived equines were: an Australian horse which died at the age of 53; a Welsh pony at 52; a Russian pony (used by the British in the Crimean War) at 49.

## Babies Born with Sight

Q.—HOW long is it after birth until babies can see?—A. N. F., Haverhill, Mass.

A.—BABIES can see at birth, according to Dr. W. C. Beasley of Johns Hopkins University. He carried on extensive studies in this field and found that newborn babies can see ordinary objects as well as light. Negro babies rated highest in these early tests.

## The Morning Eye Opener

Q.—WHAT fruits were crossed to produce the grapefruit and how did it get its name?—B. G. G., Sioux City, Iowa.

A.—THE grapefruit or pomelo is not a hybrid but a variety of the shaddock which is a member of the citrusous family. It received its popular name of grapefruit because the fruit hangs in grape-like clusters from the trees. The fruit was first brought to this country from the Malay archipelago.

## Fido's Good-Night Turn

Q.—WHY do dogs turn around before they lie down?—T. H., Johnstown, Pa.

A.—THE habit of dogs turning around before they lie down is a trait they have inherited from their ancestors. It is believed that the earliest dogs were developed by primitive men from wild wolves for hunting purposes. These early (Continued on page 106)

Gus Gives Some Pointers on . . .

# Winter Fuel Troubles

"DARNED if it didn't bust right off like it was made out of mush!" Dick Carnaday muttered, as he glared wrathfully at the end of the copper gasoline pipe which had broken close to the carburetor connection. No gasoline was coming out of the supply side of the break, because the motor had stopped and the fuel pump was not working, but a slow stream dribbled from the piece of pipe left attached to the carburetor. The crisp morning air was heavy with the smell of gasoline.

"It's funny I can't seem to get a tight gas line on this bus," Carnaday observed to himself. "Maybe I'd better run down to the Model Garage and see if Gus Wilson has some copper tubing that's better than this rotten stuff."

Carnaday bound the broken ends of the pipe together with a piece of tire tape. Taking a wad of chewing gum out of his mouth, he smeared it over the binding and covered it with another layer of tape.

"There," he decided, "that ought to hold until I can get to Gus's place." A few minutes later he was blowing his horn before the door of the Model Garage.

"Howdy, Gus!" he replied to the veteran auto mechanic's smiling greeting, as the car came to a stop inside. "Got any copper gas-line tubing that won't break? What I've got on here now is junk."

"There's nothing wrong with this tubing," said Gus, after an examination. "It broke from crystallization because you didn't put it in right."

"What do you mean, I didn't put it in right?" Carnaday snapped. "I've fixed dozens of gas lines in my time and I never had any trouble like this before."

"You haven't put them in that way on any modern car, I'll bet," Gus maintained. "Motors in cars today aren't fastened tight to the frame the way the old ones used to be. Now they're mounted on rubber or springs to get rid of vibration. Every time you open the throttle, the motor gives a lurch in its mountings.



"It's lucky for you the gas pipe let go when it did. If it hadn't, you'd probably have got stuck at night miles from nowhere—and you'd be guessing yet what the trouble was!"

By MARTIN BUNN

Besides, there's a good deal of motor movement with respect to the frame, where you've fastened this pipe, every minute you're running. Copper isn't rubber and it won't stand bending and vibrating all the time.

"If you had cut that pipe fifteen or eighteen inches longer and put a five- or six-inch loop in it," Gus continued, "the loop would have had spring enough to take up the vibration and the tubing wouldn't have crystallized and broken off. How'd you come to put a new pipe in, anyway? This car isn't so old it should need one."

"I should have had sense enough to realize that was what was wrong," Carnaday growled, "only I didn't know the motor moved so much. You can't see it move when you're driving and there's no motion you can see when it's idling. I suppose it really didn't need a new pipe."

Carnaday muttered as he slipped a rule from his pocket and started to measure for the copper tubing needed to install a new gas line.

"One of the connections was leaking a bit when I bought the car second-hand, and somebody had dented the pipe pretty bad at one spot, so I thought I'd just put in a new one while I was at it."

While Carnaday was speaking, Gus had been poking here and there about the motor. "How

is she pulling on the hills?" he asked, straightening up again.

"Fine," Carnaday answered, enthusiastically. "The car's got more pep on the hills than I'll ever need. Only thing I noticed was that she sputtered a bit just as I got to the top of Blake Mountain, this morning. That was just before the pipe broke, so I guess it must have been leaking so bad the carburetor didn't get enough gas."

"Maybe," Gus grunted, "but I'm saying it's lucky for you the gas pipe let go when it did. If it hadn't, you'd probably have got stuck miles from nowhere—and you'd be guessing yet what the trouble was!"

"Why, what's wrong?" Carnaday asked, sticking his head under the hood and looking about anxiously.

"Same thing that happened to a brand-new car last week," Gus smiled. "Do you notice anything wrong with that fuel pump?"

Carnaday ran his fingers over the pipe connections. There appeared to be nothing wrong with them. "Do you think I've X-ray eyes?" he demanded. "How can I see what's wrong inside this pump?"

"There's nothing wrong inside," said Gus. "The pump itself is all right. The trouble is, the bolts holding it to the crankcase have loosened. The pump is moved up and down a little by the lever when the cam on the cam shaft turns over, instead of the pump staying still and the lever moving up and down. The movement is only a small one anyhow, and the spring that holds the lever against the cam is stiff— (Continued on page 110)

# THE HOME WORKSHOP



## Puppet Heads

MODELED FROM NEWSPAPER PULP

*The secret of making good papier-mâché ...  
It's also useful for decorations, imitation  
carvings, and model scenery and accessories*

By Florence Fetherston Drake

A head is built up by forming an egg-shaped lump of pulp around the end of a stick and modeling it just like clay. After this is dry, it is colored with common poster paints

**B**Y FAR the easiest and most practicable method for the beginner to make marionette heads is from *papier-mâché*—newspapers soaked in water and mixed with wall-paper paste. This material is, indeed, something with which every home worker should be familiar. It costs next to nothing, is easily modeled or cast into almost any form, takes paint well, and is light in weight yet almost indestructible.

The examples illustrated are all heads or masks for puppets of the conventional type. By the same method, however, you can make decorative heads or masks to hang on the wall, heads for character dolls, ornaments of various kinds, imitation carvings for furniture and woodwork, scenery for model railways, accessories for ship models and other types of models, and all sorts of odd-shaped articles that are not easily carved from solid wood or cast in plaster or metal.

There is only one secret to working successfully with *papier-mâché*, and that is to have the pulp of exactly the right consistency. Crumple single sheets of newspaper one at a time (about seven sheets for a head) and soak in water. If convenient, use hot water and soak overnight. Tear the paper into shreds or rub it on a washboard until it is as fine as possible. Drain all the water you can without pressing or squeezing it. Then you are ready to mix it with the paste. Use wall-paper paste preferably; it costs about fifteen cents a pound in the form of a powder. Otherwise, make paste by mixing flour and water to a thin, creamy consistency. Pour on boiling water and stir constantly. Let it boil for two or three minutes. It is cooked like starch and, when cold, should be as thick as custard. While it is fairly satisfactory, the commercial wall-paper paste is better.

Now mix the paste and paper pulp in the proportions of approximately one part of the paste to two of pulp. Press the water out by squeezing the mixture in a heavy stocking. When ready for modeling, it should look and feel like clay. If it sticks to a board or the hands, it is in no condition to model. Work it in a heavy cloth until it could be handled with gloves and not stain them.

Here are the tests for good *papier-mâché*:

1. If there are traces of water noticeable when you press your finger into it, squeeze the pulp more; it is too wet.

2. If it cracks open when you press your fingers into the pulp, it is too dry and needs more paste.

3. If there are lumps in it, pull them apart or discard them.

4. If it adheres to the hand, it should be worked more thoroughly.

5. Paper pulp that is in the proper condition will not shrink appreciably. It is the evaporation of excess water that causes shrinkage and excessive roughness.

Nothing is more futile than to use pulp which is not just right. You might as well model a head of mud, if it is slimy, or with soap if it is too hard or too dry. The first step in handling a portion of the pulp is to make it into a ball and work it. When right, it will instantly obey the pressure of your fingers, and you will be able easily to mold eyes, nose, mouth, and all details of a head. It will be found as responsive *(Continued on page 90)*



Three typical heads by Mrs. Drake; and, at top of the page, four puppet masks, of which three represent well-known movie characters

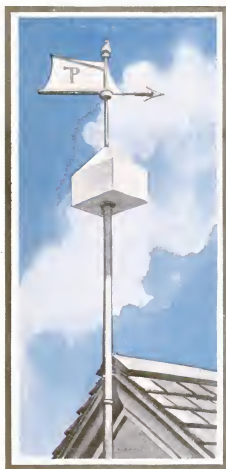
# ELECTRICAL Weather Vane

REGISTERS DIRECTION OF WIND  
ON ILLUMINATED DIAL INDOORS

By  
LEWIS J.  
PIERCE

A revolving switch in the control box immediately below the weather vane, shown at left, registers the direction of the wind on the illuminated dial illustrated at right

The revolving switch (below) has two hinged blocks weighted with lead so the brass shoe will stay in contact with the segment track



WITH this electrically indicating weather vane, you can find out which way the wind is blowing, night or day, simply by the snap of a switch in your own living room. The direction is revealed in the form of illuminated letters on a decorative dial. The vane itself is mounted on the roof, high enough above surrounding objects to register accurately. For the purposes of weather forecasting, the instrument is therefore as scientific and convenient as any amateur meteorologist could ask; and, at the same time, it is an ornamental novelty that will arouse the curiosity and admiration of every visitor.

The construction is not difficult if the directions and drawings are carefully followed. The cost is approximately ten dollars, but you may find many of the necessary materials around your own house.

Start with the vane itself, which is a piece of 1/32-in. brass cut to the dimensions in Fig. 1. Make a pattern first on stiff cardboard and transfer the outline to the brass. If desired, the vane may be made in two pieces to save material, the forward 4 in. being added on by soldering another piece of brass on each side and overlapping the joint, as in Fig. 1A. Even if made in one piece, reinforce this part to prevent bending. The tail also should be reinforced by soldering four 1-beams, made from left-over material, in the positions shown. Bend these beams by clamping in a vise and hammering over a few inches at a time.

The vane is supported by a brass rod

3/4 in. in diameter and 30 in. long. When you buy this rod, also obtain a brass tube 14 in. long and of sufficient inside diameter to allow the rod to turn easily within. On one end of the rod, turn threads with a No. 24 die to a depth of 11 in. Be sure the threads are cut true. A plumber or garage mechanic will thread the rod for you at a small expense, if necessary. Obtain a cone intended for the front hub of a bicycle and screw it on the rod to the full length of the threads. Tighten it firmly.

When you get the bicycle cone, also obtain the front hub and ball bearings it fits. One of the older type is preferable, with the hub of brass and the seats for the bearings of steel. Lay these aside until later.

Clamp the rod in a vise with a piece of wood on each side to protect the threads, and saw a slot the width of a hack-saw blade to a depth of 10 in., sawing only about 3 in. at a time. Now place the rod

in the vise so the slot is horizontal, insert the vane in the slot with the bottom edge of the tail 12 in., and the top edge 9 1/2 in., from the rod, and solder firmly in place.

The vane is very effective because of the big tail surface. To counteract some of this weight, a lead ball is added next to the point. An easy way to do this is to make a wooden mold in two parts to the dimensions in Fig. 2, leaving a channel large enough to admit the forward part of the vane. Screw the mold tightly together and pour in hot lead slowly until filled. Heat the point of the vane, insert it in the mold to a depth of 3/4 in., and hold until the lead solidifies. Be sure that you heat the point of vane before inserting it in the hot lead, otherwise the lead may spatter dangerously.

A simpler method of counterweighting is to solder lead strips to the point of vane (Fig. 1A). Do not make it balance so evenly that it will react to every little gust of wind, but leave the tail heavier.

Solder the brass pointer to the lead ball and true it up by eye.

Now cut the bicycle hub apart with a hacksaw about 1 in. from one end and file the nickel plating off around the end of the larger piece, ready for soldering. Place it in a vise and solder the brass tube to the end of the hub, so that when the rod of the vane passes through both, it will rotate freely. Assemble the bearing and true the assembly accurately. Cover it with an inverted lead cup soldered to the bottom of the vane as in Fig. 1.



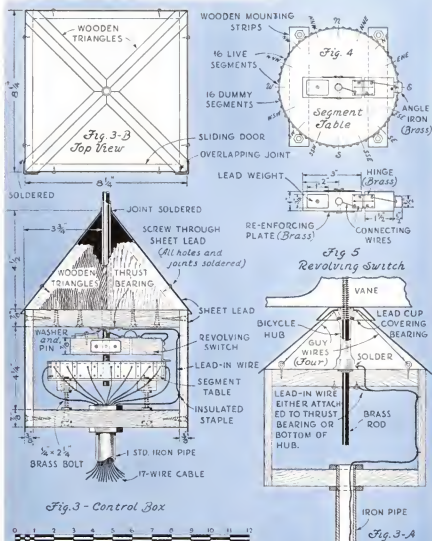
If you cannot obtain a front bicycle hub of brass, you can use one of steel and have it welded to the brass tube.

As an alternative to this method of mounting the vane, you may use a whole front bicycle hub with both bearings, as in Fig. 3A. It should be fastened directly to the top of the control box with screws down through the hub.

The end of the brass tube fits into a hole bored in the middle of a  $\frac{3}{4}$ -in. piece of wood  $7\frac{1}{2}$  in. square, which forms the top of the control box. Over the hole on the underside, screw a brass strip with a  $\frac{3}{8}$ -in. hole reamed large enough for the rod to turn easily in. This prevents the tube from slipping through the wood and also acts as a thrust bearing. Pin the rod under the thrust bearing so it cannot raise (Fig. 3).

Make the control box as shown in Fig. 3, fastening the parts with  $1\frac{1}{4}$ -in. brass screws. Leave two opposite sides off temporarily to give access to the interior. Brace the tubing vertically with four wooden triangles screwed to the top of the box.

Now cut a circular piece of wood 6 in. in diameter from  $\frac{3}{4}$ -in. stock, and draw two diameters perpendicular to each other on its face. By bisecting the angles, divide the face, and thus the circumference, into sixteen equal parts. Taking one of these as north, proceed to mark off a segment  $\frac{7}{8}$  in. wide on each one (sixteen in all), leaving sixteen narrow segments (about  $\frac{1}{4}$  in.) between them.



How control box, segment table, and switch are made. There are sixteen "live" segments separated by narrow "dead" segments

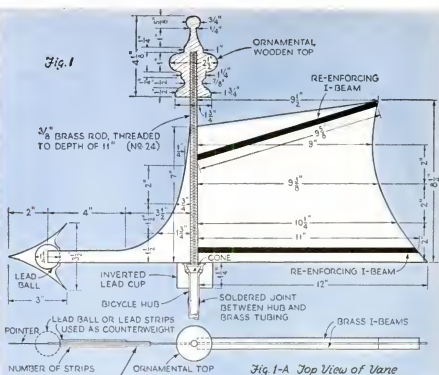
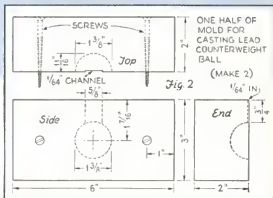


Fig. 1-A Top View of Vane



The vane itself, a view showing two types of counterweights, and a mold for casting the lead ball, if used

Screw a strip of brass  $1/32$  by 1 by 19 in. to the edge of the wooden disk, starting at one side of the north segment and letting the upper edge of the brass project  $\frac{1}{8}$  in. above the surface of the wood. Bend it around the block and cut it off at the north segment, leaving the start and finish separated by a crack about  $1/64$  in. wide. Continue the segment markings of the wood over onto the brass so as to divide it into sixteen large and sixteen small segments. Drill two holes in each segment, staggering those in the large ones, and screw the entire brass strip to the block before cutting the thirty-two segments apart with a jeweler's saw or some other narrow saw blade. Then screw two  $\frac{1}{4}$  by 1 by 6-in. wooden strips to the bottom, and drill a  $\frac{1}{2}$ -in. hole in the middle of the segment table.

Before mounting the segment table in the control box, make the revolving switch as shown in the detail drawing, Fig. 5. The two blocks are joined by a brass hinge, over which three fine wires have been soldered to carry the current better. The brass arm that rotates over the segment table is cut from a brass angle iron, and the bottom is rounded with a file. Both blocks are weighted with lead strips. When you slip the revolving switch on the brass rod and pin it in place, be sure it points in the same direction as the vane.

Now mount the segment table in the control box on four brass bolts through holes in the wooden strips on the underside of the table, and adjust by raising or lowering the nuts on the bolts to provide a level (Continued on page 92)

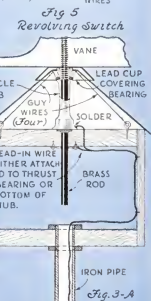
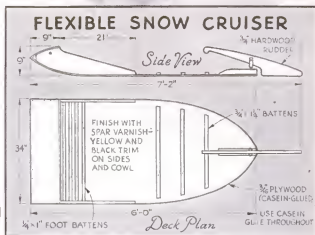
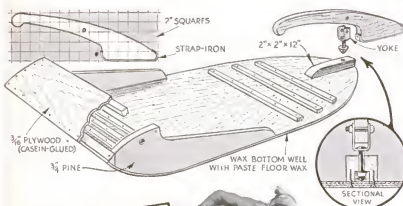


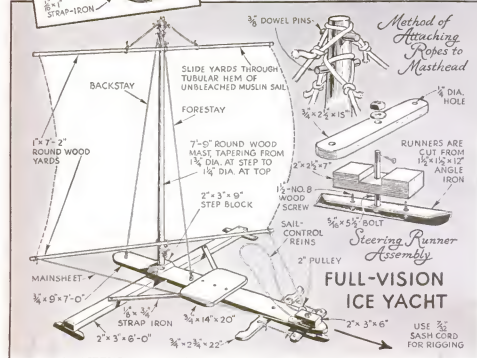
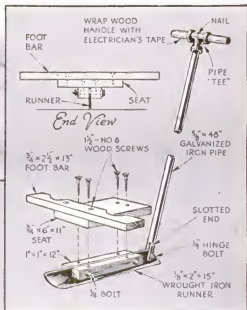
Fig. 5-A

# FIVE EASILY BUILT Novelties for SNOW and ICE SPORTS

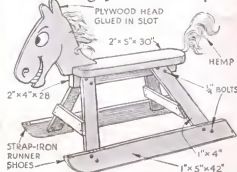
By Hi Sibley



## SKAGWAY SKIZZER for use on the ice...



## ARCTIC BRONCO Will carry four astraddle!



• She has flown the President's flag •

## VINCENT ASTOR'S YACHT

# Nourmahal

A  
Miniature Model  
Designed Especially for  
the POPULAR SCIENCE  
MODEL-of-the-MONTH CLUB

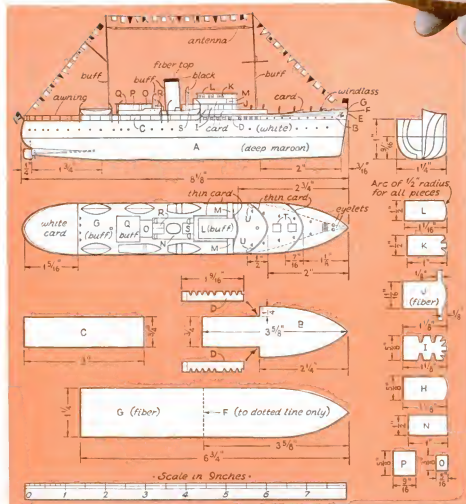
By  
THEODORE  
GOMMI



This model of the palatial twin-screw Dieselyacht *Nourmahal* is 8 1/4 in. long. The hull block is cut from one piece, but the superstructure is built up very simply from thin materials

**N**OURMAHAL, a power yacht of modern design, is our new model of the month. It is through the courtesy of her owner, Mr. Vincent Astor, who made the plans of the original vessel available, that we are able to present a model of this twin-

Drawings of the assembled model and principal details appear below. See list of materials for thicknesses



screw Diesel yacht, one of the largest and finest afloat. She has had the distinction of flying the President's flag on several occasions, besides being flagship of the New York Yacht Club for three years.

In keeping with the previous models of this series, the simplest construction has been used, and the fittings and materials are similar to those described for the freighter model (P.S.M., Oct. '35, p. 57). The scale of the model is 1/32 in. equals 1 ft.

White pine is recommended, especially for the hull, though balsa wood may be used. The remaining materials, which are easily obtained, are described in detail at the end of this article.

Cut all wood and fiber to the sizes specified in the list of materials. Sandpaper E so that it tapers gradually from its full thickness to a sharp edge. Cut out the two corners of B. Glue B to A, E to B, and F to B and E. On the block thus formed, draw the shape of the deck, and cut away the excess wood. Proceed to shape the hull, using the cross-section diagrams for guidance, as well as the dotted water line shown in the plan. Before rubbing down with sandpaper, cut the notches in the two D pieces and insert them into the corners cut out of B. Now finish the shaping of the hull with fine sandpaper.

Attach the rudder, which is a piece of card or fiber folded over a 1/2-in. pin; and insert the

(Continued on page 100)

# New Woodworking Plans

*A combination reading table and newspaper rack  
Book ends designed like ship's gangway boards...*



## MODERN READING TABLE BUILT FROM A SINGLE WIDE BOARD

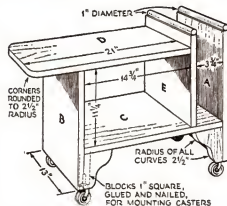
**E**VEN a beginner in woodworking can easily construct the modern-looking combination side table, smoker, and newspaper rack illustrated above. It is necessary to purchase only one board, dressed

to  $\frac{3}{4}$  by 13 in. by 10 ft. The board may be of any suitable wood, and it should be sanded at the mill.

Cut the board into the following lengths:  $19\frac{1}{2}$  in. for A,  $17\frac{1}{2}$  in. for B,  $19\frac{1}{4}$  in. for C, 21 in. for D, and  $13\frac{1}{4}$  in. for E. Make the four legs from 4 by  $5\frac{1}{2}$ -in. pieces with a key hole, jig, or band saw. Round the corners of the D piece at one end as indicated. Sand the sawed edges to a squared finish and assemble with good glue and finishing nails in the following order: Nail two legs to B and two to A. Fasten board C to both B and A. Nail through C into the legs. Next assemble the boards D to E. Finally nail E to C and D to B.

Rubber casters  $1\frac{1}{2}$  in. in diameter are then mounted on the inside corner of each leg. They are set into holes drilled in blocks 1 by 1 by  $5\frac{1}{2}$  in., the blocks being glued and nailed in place.

The two upright members E and A are



How the table is assembled. Fasten parts D and E together before putting them in place

capped by cylindrical wooden bars finished to a diameter of 1 in. If no facilities for turning them are available, a 1-in. round rod or dowel may be purchased.

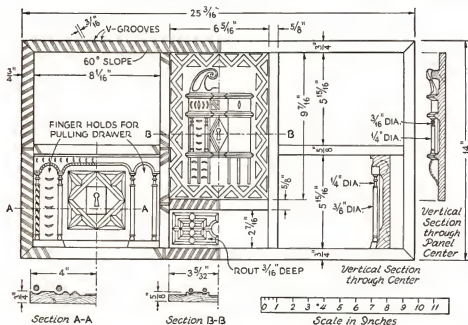
Countersink the nails, fill the holes, and stain and varnish to the desired finish. The table photographed cost 60 cents for lumber and 40 cents for the rubber-wheeled casters.—HEINIE DEERWESTER.

## Silver Chest of Spanish Design Enriched by Simple Carving

**B**ASED on the design of a Spanish vargueno of the seventeenth century, this silver cabinet is enriched by carving of a decorative yet easily executed pattern. Three small drawers provide ample space for ordinary silverware, while a bin above, covered by a hinged lid, stores table linen. The depression above the center drawer might be used as a secret compartment.

Walnut is the wood for this cabinet,

but mahogany or other open-grained lumber with a bit of ribbon in the grain may be substituted. The plywood used for the box gives opportunity to join the top rails to the ends with rabbets at the back and combination rabbets and miters in front, the face veneers of the end pieces being left to cover the end wood of the rails. Because of the strength the several partitions give, they may be united with dow-



Front layout. There are three drawers in the lower half, with space for a secret compartment



The cabinet closed. See page 79 for a view showing the top raised and one drawer open

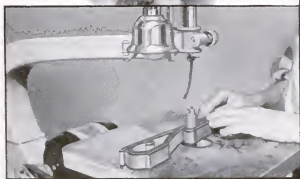
eled butt joints in the simplest way.

There is nothing difficult about the carving, which is mostly straight-line work. Observe the hollows behind the colonettes and the crescent chisel cuts made by two shearing movements each of the gouge. To save wood, as well as labor, the base and entablature may be shaped and added separately. V- (Continued on page 77)



# for Winter Evenings

... Scroll candleholders ...  
Richly carved Spanish chest



Sanding with the scroll saw and, above, boring a candle cup



## SCROLL-SAWED CANDLEHOLDERS

A GRACEFUL outline enhanced by contrasting woods is what gives these candelabra their distinctive appearance. Maple and black walnut are satisfactory, but the small amount of material necessary makes it feasible to use costlier combinations.

The work may be done en-

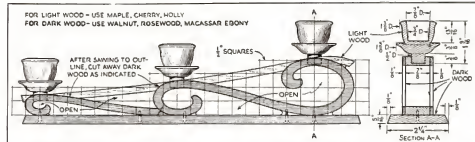
tirely on the scroll saw and lathe with the assistance of the usual hand tools. For cutting two scrolls, glue up a blank  $3\frac{3}{4}$  by 13 in., consisting of a  $\frac{3}{4}$ -in. piece of light wood between two  $\frac{1}{2}$ -in. pieces of dark wood. Make a full-size pattern on heavy paper or cardboard and scribe around it on the blank to mark the scroll outlines, including, of course, the top sloping bar. Cut to outline on the scroll saw, using a  $\frac{1}{4}$ -in. wide blade where possible and changing to a  $\frac{1}{8}$ -in. wide blade for the small radii. With chisel and pocketknife remove the layer of  $\frac{1}{8}$ -in. dark wood along the upper bar as indicated on the drawing. A router bit in the drill-press, if available, will facilitate this operation.

Then file and sand smooth all over. A sanding drum used in the scroll saw as shown will help in doing this. Make up the base and screw it to the scroll, and bore the  $\frac{1}{2}$ -in. diameter holes at the candle locations.

If expensive wood is used for turning the candle bases, material may be conserved by turning them all at once between centers. A piece of stock  $1\frac{3}{4}$  in. square by 12 in. long will make six. After turning to outline, cut them apart, chuck them separately as shown, and bore and turn to fit the candles. Another method, simpler mechanically but which uses 50 percent more stock, is to mount a block  $1\frac{3}{4}$  in. square by about 3 in. long on the screw chuck of the lathe and turn, bore, and finish each holder at one chucking.

Finish the wood before assembling the various parts. Fill the grain with a coat of transparent filler thinned with linseed oil and turpentine, and seal with a thin coat of white shellac. If holly is used, omit the filler and use successive coats of shellac. A type of self-leveling, quick-drying varnish which can be wiped on with a cloth is suitable for the final coat, but it should be applied with a camel's-hair brush on this particular job.

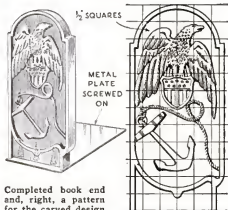
The design may be varied by building up a blank  $1\frac{3}{4}$  or 2 in. thick—wide enough to give stability but not too thick to cut on your scroll saw—and leaving off top bar and base.—DONALD A. PRICE.



Working drawing with squares to aid in laying out a full-size pattern to trace on the wood

## BOOK ENDS BEAR FAMOUS NAVY SYMBOL

IN SHAPE and design, these nautical book ends represent the top portion of the gangway boards of the U.S.S. *Constitution*, slightly modified to give more width. Although any wood that is not too soft may be used, the rugged texture of oak seems to suit the subject best. The



Completed book end and, right, a pattern for the carved design

book ends shown in the photograph were made from wood taken from "Old Ironsides" when being rebuilt, and the base plates are part of her copper sheathing, but these historic materials are no longer to be had.

The carving is the usual process of making a full- (Continued on page 79)



Book ends with design from "Old Ironsides"

SKILL... LUCK... EXCITEMENT

Combined in New

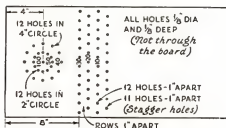
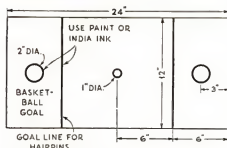
# Walking-Top Game

By PAUL R. RANNIE

HERE is a fascinating new top-spinning game that requires very little equipment. For a playing board, you can use a leaf from a table or a bread board, and one of the small wheels from an old alarm clock will serve as a top.

The idea of the game is that you control the "walking" of the top by tilting the playing board in various directions. If you tilt the playing board to the left, the top walks away from you (that is, if you have spun it in a clockwise direction). Tilt the board to the right and the top walks back to you again. Raise your end of the board and it walks to the right, and if you lower it, the top walks to the left. This peculiar walking action of the top and a player's first attempts to control it will cause much amusement.

If you want to make a regular playing board, a good size is 12 by 24 in. Wood, pressed wood, plywood, or even ordinary heavy cardboard may be used. The top spins longer and walks better, of course, if the surface is smooth. A coat of glossy enamel improves the surface, but is not essential. The drawings show how to lay out the board for the various games. Note that the holes in the board for one of the games are only  $\frac{1}{8}$  in. deep. If the holes are too deep, the top jumps out when the spinning disk touches the board. Some of the accessories are shown in the group of drawings on page 99.



How to lay out the two sides of the board, which may be wood, cardboard, or composition

After spinning the miniature top, you "walk" it along and try to get it into a high-scoring hole



The other side is marked for various games. In this instance, hairpin-shaped wires are being dragged from one goal to the other

While a top made from an alarm-clock wheel will spin and walk very well, you can make a better one from a small piece of brass and an ordinary nail. The dimensions are shown in the drawing. Note the method used for holding the parts in the correct position when soldering. Clean and tin the parts thoroughly before putting them together for soldering. After soldering the top, place it in the chuck of a hand drill, clamp the drill in a vise and, while turning the handle, file off excess solder, sharpen the lower end, and true up the top disk.

First learn to walk the top to the end of the board and back. Then try walking to the end and around some object and back. Put up two of the folded cardboard pylons or any other small object and see who can make the most laps around them on one spin without touching them. Try a race with the cardboard bridges to go under. Also put up two pylons and see how many figure eights you can make around them.

Children are especially attracted by the little airplane. The top spins in the hole and walks along with the airplane. A rubber band or a loop of string may be moved along in the same way. When coming to a turn, you will find that you can make it sharper if it is made in the direction the top is spinning.

Any one addicted to the now popular marble games should enjoy the game with

Excellent tops may be made by using a drill as a lathe. Note the block used for soldering



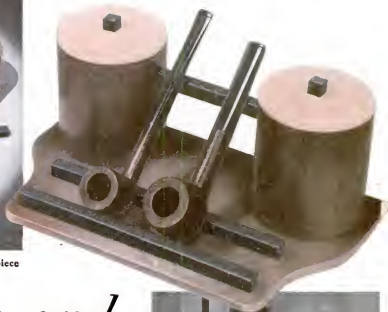
Some of the accessories, including a miniature airplane and pylons

the numbered holes. There is a lot of chance even if you become an expert at guiding the top. Let each player have three or more turns and see who gets the highest score. The first row with no number counts nothing.

Another game, which might be called "hairpins," is played by placing four of the wire loops behind one heavy black goal line and three behind the other. The player with three loops spins first and tries to walk off with one of his opponent's hairpins. He must take it behind his goal and walk free of it, and then walk off his end of the board. If his top "dies" on the board, he must return the hairpin. He may get a second pin from his opponent if he has enough spin left, but for each time he dies on the board he must return one of the hairpins. The first player getting all of the pins wins the game. When he returns with the *(Continued on page 99)*



The parts after being cut out and polished, and, at right, the finished piece



# Pipe Rack *and* Twin Humidors

QUICKLY MADE FROM BRILLIANT  
NEW CAST-RESIN MATERIALS

By ALBERT Q.  
MAISEL

**M**ODERN and expensive-looking in both material and design, this combination of twin tobacco humidors and pipe stand can be made in a few hours by any amateur craftsman, even a beginner. It is formed entirely of the gemlike new plastic compositions known as cast resins (see P. S. M., Nov. '35, p. 59, and Dec., p. 63). Only three stock types of material are required, yet, because of the innumerable colors available in resin castings and because of the wide variety of possible decorations that may be added, each home worker can give the project individuality and make it an outstanding example of fine handicraft.

The required castings are a 6 by 16-in. sheet of  $\frac{1}{4}$ -in. thick stock, an  $8\frac{1}{2}$ -in. long cylinder with an outside diameter of  $3\frac{3}{16}$  in. and an inside bore of  $2\frac{5}{8}$  in., and three  $\frac{3}{8}$ -in. square rods, available in 7-in. lengths. These weigh about  $2\frac{1}{2}$  lb. All are standard castings and may be obtained in almost every color, mottle, or degree of transparency. For photographic clarity, the humidor covers on the model illustrated were made from stock of a different color, but an excellent effect and greater economy of material is possible if the base and covers are cut from the same sheet.

In laying out the base, plan to cut away one section on either end of the 16-in. sheet large enough to permit a circular cover to be jig-sawed from the otherwise waste material. The base is 10 in. wide at the back and  $7\frac{3}{4}$  in. at the front. The



The crossbar is held between soft wood blocks while the ends are filed to conform to the curve of the humidors



curve is best determined by placing the cylinders on the base and following their contours. If a French curve is available, the most pleasing design can quickly be ascertained. To make the cut, use either a hand or power-operated jig saw or a band saw. Finish the cut by holding the edge of the base perpendicular to a sanding wheel or grinding stone. Also round off the corners, using a radius of approximate-



The covers were cut from different stock in this case, but may more economically be made from the waste ends of the base

ly  $\frac{1}{2}$  in. on the front corners and  $\frac{1}{4}$  in. on the back.

If you desire, you may vary the design by beveling the upper edge all around the base to an angle of 45 deg. Use the sanding wheel or a sandpaper block. A somewhat simpler process calls for sandpapering the edge to give a soft, round effect. This is best accomplished by hand with a curved sanding block.

Having cut the base, take the two excess portions of the sheet and lay out and jig-saw the circular cover pieces. These should be sawed to a diameter  $\frac{1}{16}$  in. greater than that of the cylinders to allow for the final grinding and polishing. Drill a small hole through the center of each disk and countersink it on the underside so that the screw holding the handle in place will not protrude. Then attach the disk to the faceplate of a lathe, with the upper surface against the plate, and turn a right-angle rabbet or notch around the edge of the disk. This should be about  $\frac{1}{8}$  in. deep and wide enough to permit the cover to fit snugly into the top of the cylinder. You will find there is a slight variation in the

(Continued on page 93)



# Circus Dog Toy

## for Small Children

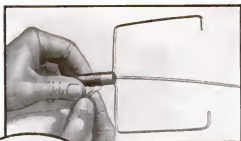
As the toy is pushed along the floor, the dog jumps up and down with a rolling motion

**T**HIS circus dog rolling a cylinder is a simple, sturdy, and amusing toy for a small child.

The dog is drawn full size on a piece of  $\frac{1}{2}$ -in. plywood and cut out. The cam, which is 3 in. in diameter and shaped as shown in one of the photographs, is also made from  $\frac{1}{2}$ -in. plywood. The two wheels, which are 4 in. in diameter, are cut or turned from  $1\frac{1}{2}$ -in. solid wood. The cam is glued and nailed to one of the wheels; then the other wheel is nailed on. These parts are painted in brilliant colors.

The handle is a piece of  $\frac{1}{2}$ -in. dowel 22 in. long. It is grooved in three places at one end, and the other end is rounded. The three bent-wire pieces are set in the grooves and wrapped with No. 20 copper wire. Solder this assembly securely. Put two small screw eyes in the dog as shown and slide the supporting wire through these eyes before finishing the bending to form the dog's tail. Drill a  $\frac{1}{8}$ -in. hole in the center of each roller, put a washer over the holes, and snap in the wires.

As the toy is pushed along, the dog jumps up and down.—RALPH T. MOORE.

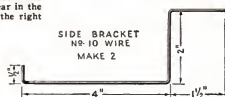
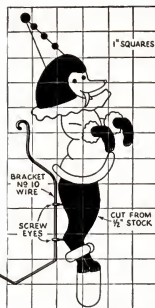
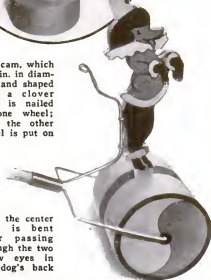


The three wires are set in grooves in the handle and bound with wire. The size and shape of these wires are made clear in the drawings at the right



The cam, which is 3 in. in diameter and shaped like a clover leaf, is nailed to one wheel; then the other wheel is put on

How the center wire is bent after passing through the two screw eyes in the dog's back



## CRYSTALS PHOTOGRAPHED WITHOUT MICROSCOPE

CRYSTAL photography is a new and fascinating hobby. Although it is really a specialized branch of photomicrography, it does not require an expensive high-powered microscope. All you need is a snapshot camera and a small hand telescope, which contains the ocular, is unscrewed and mounted with the aid of an ordinary burette clamp or a homemade substitute, as shown below. This serves as a microscope. The camera is simply placed on top and held there while the exposure is made.

A 100-watt lamp gives enough light for the photos. Translucent crystals should be exposed for from 5 to 8 seconds, opaque crystals from approximately 8 to 10 seconds.—NORTON S. LOVE.



The apparatus is set up so the crystals should be viewed by reflected light. Left: Potassiumpermanganate crystals only 1/40 in. long



## PHOTO PRINT WASHER ROCKS ITSELF

**A**LTHOUGH it operates on a small trickle of water, this washer for photographic prints rocks automatically as one side fills and the other empties. It will wash two dozen 8 by 10 in. prints very quickly.

The galvanized iron tank is 4 in. deep, 11 in. wide, and 18 in. long over all, with a center partition 9 in. high. A row of holes  $\frac{3}{4}$  in. in diameter are punched in the ends as shown to allow the water to escape. A strip of metal, bent V-shape, is soldered across the tank on the underside to form the edge on which the tank rocks. The V projects down about  $1\frac{1}{2}$  in. below the bottom.

The frame on which the washer rests consists of two sidepieces of wood 2 in. wide and 18 in. long and two end pieces 2 by 11 in., nailed on top of the sidepieces. A length of  $\frac{1}{8}$ -in. wire is pointed at each

end, bent over at the ends to form a sort of very long staple, and passed through the V. The ends are then driven into the sidepieces to hold the V in place. The washer is set in the sink with the partition under the faucet.—W. EDWARD WHITE.





INEXPENSIVE

# Vacuum Pump

*Makes possible many dazzling experiments*

By

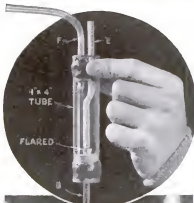
WALTER  
BACH

The heart of the pump is shown in the circle below. The rubber stoppers are fastened with sealing wax

A SIMPLE vacuum pump like the one illustrated makes it possible for the home physicist to demonstrate the fluorescence of solids and liquids, the effect of pressure on boiling points, cathode-ray phenomena, and phosphorescence in a series of striking experiments. Three dollars (or only seventy-five cents if you already have one or more pounds of mercury) covers the cost of the pump, yet it opens an entirely new field to the amateur. Your druggist probably stocks most of the materials needed; if not, they can be obtained from any scientific supply house.

The wooden support is a board 4 by 53 in., with a 4-in. wide shelf at top and bottom. A large hole for a glass or enameled funnel is bored in the top shelf, and two stand-off supports for tube *B*, made as shown on page 102 from small dowels, are glued into holes in the main support. Tube *B* is held in a groove at the end of each dowel by rubber bands passing through two small screw eyes.

To assemble the glass portion of the pump, take a 40-in. length of  $\frac{1}{4}$ -in. outside diameter glass tubing (*B*) and heat one end in a Bunsen-burner flame. Heat the glass gently at first by moving the tube in and out of the flame a few times. When the end is red hot, flare it out by pressing on the inside with a warm nail and turning the tube till a small funnel is formed. The other glass tubes should be cut to length by scratching them with a triangular file and bending slightly at the scratch. The tubing can be easily bent to shape by heating it until soft.

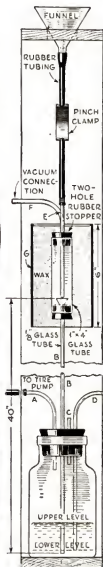


Stretching down the outlet of a T-tube to simplify sealing. A working handle is attached because the tube is so hot

When all the tubing is cut and shaped, assemble tubes *B*, *E*, and *F*, and the 1 by 4-in. tube by using rubber stoppers as shown. If you have any difficulty in obtaining the 1 by 4-in. tube, a test tube 1-in. in diameter can be cut to length by scratching a groove with a file all the way around at the point of breakage and lightly tapping the scratch. Punch a small hole in the bottom of the cardboard container *G* and slip the container up tube *B* into place.

Next assemble the cistern and place it on the lower shelf. When the pump is put to-

A T-tube, shaped into an S, glows beautifully when the spark is passed through it



Filling the funnel with mercury. It should never be permitted to become entirely empty

gether, tube *B* should just clear the cistern bottom, while the end of tube *D* should be a  $\frac{1}{4}$  in. higher. With the glass part of the pump in position, bolt the cardboard container to the back board with a  $\frac{1}{2}$ -in. space between the lower rubber stopper and the bottom of the container. Melt a little sealing wax around the hole in the cardboard container where tube *B* passes through. The container itself is filled with paraffin wax, but before pouring the wax, allow it to cool until a little will solidify on a match stick dipped in to test it. Fill the container and allow the wax to set undisturbed. The addition of the funnel, rubber tubing, and pinch clamp completes the pump.

To operate the pump, fill the funnel with mercury and open the pinch clamp, allowing all but a small amount to run out. Do not let a whirlpool form in the mercury in the funnel. The mercury drops down tube *B* into the cistern. Set a small-necked bottle under the cistern spout (*D*), place your finger over the opening of tube *C*, and put an easy pressure on the auto tire pump. The mercury will pour out of the spout into the small-necked bottle. It is then poured back into the funnel, and the entire process is repeated again and again—running the mercury slowly through the apparatus, pumping it from the cistern, and refilling the funnel.

As the mercury pours out of tube *E* into the little funnel on tube *B* in the heart of the pump, some air is entangled and carried down tube *B* by the falling mercury, escaping into the cistern. Pouring the mercury through two or three times will produce a low vacuum, one in which there is still a relatively large amount of gas left, while a dozen times or more will produce a very high vacuum.

While the pump is operating, some interesting effects (*Continued on page 102*)



# THE Wiley Post Training Plane

*A New Simplified Scale Model  
Designed by DONALD W. CLARK*

MODEL makers will be interested in this design not only because it is a neat, modern biplane, but also because it bears the name of Wiley Post, the world-famous aviator who met his death with Will Rogers in Alaska. Known as the Wiley Post model A two-place training plane, it is powered with a converted Ford model 1A automobile engine developing 40 h.p. The plane is capable of flying 80 m.p.h., has a cruising speed of 70, and can be landed at 25. It has a side-by-side seating arrangement with dual controls.

In relation to the full-sized plane, the model illustrated is on the scale of  $\frac{3}{4}$  in. equals 1 ft. It has a wing spread of 103 $\frac{1}{4}$



When the wings have been cut out, the final rounding and finishing are done with sandpaper. In circle: Bending the "prop" to form the pitch

Easy as it is to make, the model is highly realistic, as this photo of it demonstrates



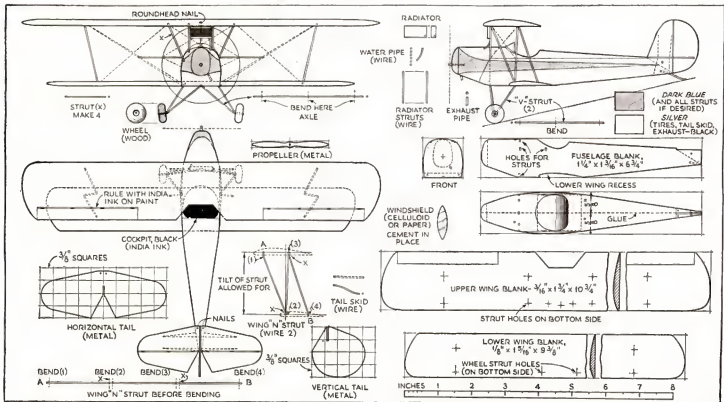
quired, of which six are wood. All the struts can be made of 1/16-in. soft wire, which is easily bent. The ends of the struts are inserted into holes drilled in the fuselage and wings, and a touch of glue holds them securely.

The radiator may be represented by ruling cross lines with black ink on paper, cutting pieces to fit, and gluing them to the block. India ink also should be used to stain the cockpit opening and the tires.

Before assembling the model, make a paper pattern according to the outline of the blue trim and trace it onto the fuselage with a hard pencil. This will show after the first coat of paint is on, and will make it a simple matter to apply the trim color accurately. The color scheme is silver (aluminum) with dark blue trim.

in., and the fuselage is 6 $\frac{3}{4}$  in. long.

While the numerous wing struts may make this model appear somewhat complicated, it is by no means a difficult job to construct. Only twenty-four parts are re-



Complete working drawings. The principal dimensions are shown by the sizes of the blanks; other dimensions may be found by using the scale

# SEASON'S GREETINGS



FROM

R-J-REYNOLDS TOBACCO COMPANY

MAKERS OF CAMEL CIGARETTES AND  
PRINCE ALBERT SMOKING TOBACCO

## Camels

Of course you'll give cigarettes for Christmas. They're such an *acceptable* gift—such an easy solution of your problem. And Camels fill the bill so perfectly. They're made from finer, MORE EXPENSIVE TOBACCOS than any other popular brand. They are the accepted cigarette of the social, business, and athletic worlds. Their finer tobaccos give that pleasant "lift"—that sense of well-being so appropriate to the spirit of Christmas.



A Christmas special—4 boxes of Camels in "fat fifties"—in a gay package.

At your nearest dealer's—the Camel carton—10 packs of "20's"—200 cigarettes.

A full pound of Prince Albert in an attractive gift package.



A full pound of Prince Albert packed in a real glass humidor.

## Prince Albert

Fine tobacco for Christmas. For more than a quarter of a century, the mellow fragrance of Prince Albert has been as much a part of Christmas as mistletoe and holly. So to the pipe smokers on your Christmas list give Prince Albert, "The National Joy Smoke." It's the welcome gift. For more men choose Prince Albert for themselves than any other pipe tobacco. Let every pipeful of Prince Albert repeat "Merry Christmas" for you.

TRICKS IN USING MODERN  
FLOOD AND FLASH LAMPS

# Lighting Your Photos

By Frederick D. Ryder, Jr.

ORIGINALLY an outdoor, daytime avocation, amateur photography has now become a hobby that can be carried on at any time, by night as well as by day. For this expansion in our picture-taking possibilities, we must give credit to the introduction of supersensitive types of panchromatic film and to the amazingly powerful and inexpensive light sources now available. In fact, there is hardly a type of night picture possible with professional lighting equipment that cannot be duplicated easily and inexpensively by the amateur photographer.

For any kind of indoor night photography that includes human beings in the picture, you need light and plenty of it. It is obvious, of course, that pictures of inanimate objects, room interiors, and so on, can be taken with any kind of simple artificial light.

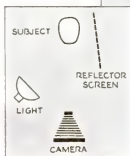


Fig. 2. A simple set-up. The reflector is optional.



Fig. 1. Only two ordinary photoflash bulbs were used in taking this back-lighting picture. They were arranged as in the diagram at left.

It is merely a question of giving a sufficiently long exposure.

Animate objects, whether grown-ups, children, babies or animals, however, cannot be successfully photographed if you have to give prolonged time exposures. In my own experience, no exposure of much more than two seconds can be made in photographing a grown-up with any reasonable certainty of getting a sharp picture, unspoiled by the subject's involuntary motions. Indeed, unless the pose is exceptionally steady, it is better not to exceed a half second. For small children, a half second certainly is the top limit, while for babies and

ordinary animals, a fifth-second exposure is the top, and a tenth or a twenty-fifth is safer.

The only convenient sources of light that are inexpensive and sufficiently powerful to permit such brief exposures are photoflood and photoflash lamps.

Many people have the impression, gained from looking at flash-light pictures made with old-time flash powder, that flash-light pictures are decidedly inferior to shots taken with other forms of light. This is not true. The photoflash lamp gives the same type of lighting obtainable from other sources such as the photoflood and it is, in fact, possible to duplicate any photoflood result by using photoflash lamps. The more accurate way to think of these two sources of light is to consider them alike except as to power and life. During its instantaneously brief life the photoflash bulb gives far more light than does a photoflood light; that is the only real distinction. So a choice between them revolves entirely on the permissible length of the exposure you can give, or on other factors not related to the quality of the light such as, for instance, the availability of electric current.

Taking pictures of the members of the family or friends is of more importance to most amateur photographers than any other possible subject. When such pictures are attempted by the beginner with either photoflash or photoflood bulbs and the result is not satisfactory, it is more often because the light was wrongly placed with relation to the subject than because of using too much or too little light.

It is well, therefore, to master the simpler ways to get good, plain lighting before attempting special effects and tricks. Perhaps the simplest problem of all is to take a picture of one person by using one light, and by one light I mean either a photoflood or photoflash. (Continued on page 71)



Fig. 3. Family group taken with two lights placed as in the diagram. Photoflood lamps were used while testing the effect, but photoflash bulbs were substituted for taking the actual photo.





# *This Christmas* give a **KODAK**

CHRISTMAS is the time to give, or to get, a Kodak . . . and the whole year 'round is the time to use it. These new models are smart to look at, "smart" in action—they almost think for you. Each one is the latest thing in its class. You'll find here just the gift for someone "special." At your dealer's . . . Eastman Kodak Co., Rochester, N. Y.



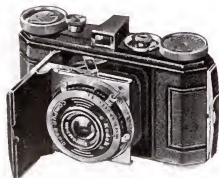
## **KODAK SIX-16** (f.4.5) . . . \$40

The most advanced Kodak of its type—precision-built, styled for today. Extra lens power lets you get snapshots in poor light . . . 1/250-second Compur shutter, self-timer, eye-level and reflecting finders . . .  $2\frac{1}{2} \times 4\frac{1}{4}$ -inch pictures. Kodak Six-20 (f.4.5) —for  $2\frac{1}{4} \times 3\frac{3}{4}$ -inch pictures—\$37.50.



## **CINÉ-KODAK "K" . . . \$112.50**

Eastman's finest home movie camera. Loads with full 100 feet of 16 mm. film. Simple for the beginner, yet versatile for the expert—by far the most popular of all 16 mm. cameras. Ideal for Kodachrome full-color movies.



## **KODAK RETINA . . . \$57.50**

Eastman's finest miniature. Takes 36 pictures— $24 \times 36$  mm.—each loading. Automatic film spacer . . . fast f.3.5 lens . . . 1/500-second Compur-Rapid shutter. A photographic masterpiece—yet it costs about half as much as other cameras of similar range.



## **CINÉ-KODAK EIGHT** \$34.50

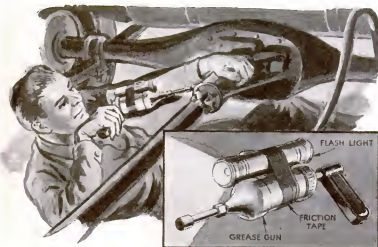
The real economy movie maker. It's ruggedly built . . . as easy to use as a Brownie. Low in cost—but more important, it makes 20 to 30 movie scenes on a roll of film costing \$2.25, *finished*, ready to show . . . Priceless movies—at 10¢ a shot.

# Useful Hints for Car Owners

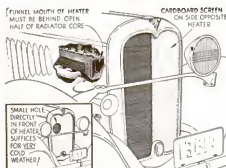
Our Readers Contribute Ingenious Solutions for Problems That Arise in Operating and Repairing Cars

## Handy Light for Grease-Gun Jobs

WHEN using a grease gun under a car, good illumination is important but not always available. By strapping an inexpensive flash light to the body of the gun with tire tape, you can provide a handy light that will always be ready for use. It will illuminate the point of the gun at all times and yet leave both of your hands free for the greasing operations.—N. E.



## Altering Radiator Covers for Hot-Air Heaters



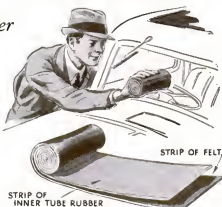
the radiator will cut off the supply of air to the heater and cut down its efficiency. If it is absolutely necessary to cover the entire radiator, provide a hole directly in front of the funnel-shaped air intake to the heater. This will maintain the flow of air and still cut down the cooling power of the radiator. In moderately cold weather, when only half of the radiator need be shielded, cover the half on the side opposite the exhaust manifold.—E. J. N.

THE EFFICIENCY of any type of car heater can be raised by plugging all holes and cracks around the floor boards and doors. Strips of gummed sponge rubber now available at auto supply stores simplify the job of weatherstripping.

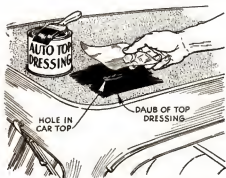
ON CARS fitted with hot-air heaters operating from the exhaust manifold, it is not advisable to use standard radiator covers. Anything that completely covers

## Windshield Spot Remover

TO REMOVE squashed insects and similar spots when washing the windshield and windows of his car, an ingenious car owner recently devised a novel roll of felt and rubber. It consists of a strip of rubber cut from a tire tube placed upon a somewhat longer strip of felt, the two being rolled into a compact cylinder and held in place by a line of stitches. When moistened with water, the felt acts as an applicator while the rubber serves as an effective squeegee to remove the softened spots.—G. E. H.

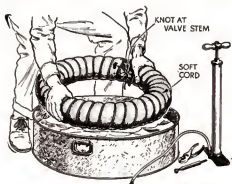


## Patching a Leaky Roof with Transparent Paper



Cemented in place with top dressing, transparent paper makes an invisible roof repair

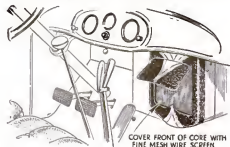
HERE is a simple and neat way to patch a leak in an automobile roof. From a sheet of transparent wrapping paper of the cellulose type cut a section large enough to overlap the leak on all sides by several inches. Then apply a coat of high-grade auto-top dressing to the leak and, when it becomes tacky, place the square of cellulose paper on the coating and smooth it out. Finally, apply a coat of top dressing to the entire top. This repair is absolutely leakproof, and the thinness of the transparent paper makes the patch practically invisible. If a candy or cigarette wrapper is too small, large rolls of the paper can be purchased.—R. R. R.



## Wrapping of Cord Helps Find Slow Leak in Tube

WHEN a tire tube develops a small, slow leak, it is sometimes difficult to locate the puncture due to the fact that it is impossible to get sufficient air pressure in the tube without causing it to bulge dangerously. To overcome this, I blow the tube up to normal size and wrap it with soft cord as shown, spacing the loops about four inches apart. The reinforcing of cord keeps the tube from bulging at weak points and allows the pressure to build up so that the smallest puncture can be traced by the water-trough method.—W. G. L.

## Screen Checks Air Flow Through Heater Core



DUE to the coarseness of the core in some automobile heaters of the hot-water type, the air passes through so quickly that it is not heated sufficiently. This can be remedied by fastening a piece of fine-mesh screening to the front of the core with wire. The screening will check the flow of air just enough to allow it to be heated properly before it passes into the car.—J. P.

## LIGHTING YOUR PHOTOS

(Continued from page 68B)

Forty-five-degree lighting is best in most cases. This means that the light should be held above the subject's head and on a line about forty-five degrees from the line of sight. Figure 2 diagrams this simplest possible artificial lighting. The question as to whether or not to use a large sheet of white cloth or news-paper on the other side of face to reflect light and lighten the shadows depends on the surroundings and the size of the room. If the room is small and has light walls and hangings, usually enough light is reflected from near-by surfaces to take care of lightening the shadows.

Incidentally, the size of the room also controls the exposure to a marked extent. Other things being equal, I would give at least twice

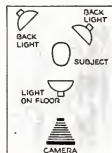


Fig. 4. A set-up for "footlight" effects

as long an exposure in an 18 by 24-ft. room with a high ceiling as in a 9 by 12-ft. room with a low ceiling.

In the same way, the type and quality of the reflector you use behind the photoflood or photoflash lamp affects the exposure. The most efficient reflector is cone shaped with a ninety-degree cone. Most of the aluminum reflectors sold

for this use are good provided they are kept clean. If a bulb is placed in the ordinary bridge lamp with its fancy shade, the light is reduced about one half. Elaborate tables have been worked out to improve the accuracy of artificial light exposures, but it is much more practical for the amateur to acquire a basic understanding of what affects the exposure and to what extent it is influenced.

Consider that the basic exposure with a regular or 25-cent size photoflood bulb is made with stop F/8 at a distance of 8 ft. with the light held at the same distance from the subject as is the camera. One photoflood bulb at the same distance and lens stop setting would call for an exposure of about a second. Using two photoflood bulbs or two photoflash bulbs would cut the exposure in half. This means you would use F/11 with the two bulbs, or in the case of the photoflood you could continue using F/8 and cut the exposure to half a second. The rule, then, is that the exposure is inversely proportional to the number of bulbs. If you are using the small 15-cent size photoflash bulbs, just set the stop to the next larger opening.

The distance from the light or lights to the subject is important. The natural inference every one makes is that the strength of the light will be in proportion to the distance from it. Actually, the brightness of the light shed on any subject by any artificial source of light is inversely proportional to the square of the distance. In plain language, this means that if you move the photoflood from 8 to 16 ft. away, the exposure will have to be increased to four seconds. Or if you move it to half the original distance, the exposure will necessarily have to be cut to one fourth of a second.

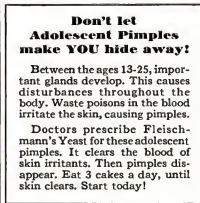
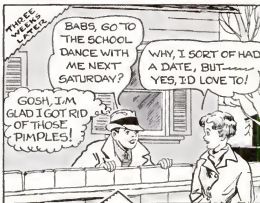
From these two rules it is obvious that it will take four photoflood or photoflash bulbs to equal just one bulb if the latter is placed half as far from the subject as the cluster of four. So if you want to cut your exposure time to the minimum or, in the case of the photoflash, use the smallest possible stop, move your lights as close to your subject as conditions will permit.

Figure 3 shows the next step in plain lighting—the use of two (Continued on page 73)



"THE FIRST GIRL I EVER LIKED—and these Pimples had to come!"

## But it wasn't too late, Ben found, to mend the trouble



—clears the skin  
by clearing skin irritants  
out of the blood

Copyright, 1935, Standard Brands Incorporated





**ALL RIGHT-  
IF YOU WON'T  
SHAVE, WE  
STAY HOME!**

HAD A RUN-IN WITH  
MY WIFE LAST NIGHT  
...SHE WANTED ME TO  
SHAVE AGAIN BEFORE  
GOING TO A PARTY.



TRY COLGATE  
RAPID-SHAVE  
CREAM!  
IT MAKES  
TWICE-A-DAY  
SHAVING  
UNNECESSARY!



**NEXT MORNING**

BY GOLLY, JOE  
WAS RIGHT! THIS  
IS THE SMOOTHEST,  
CLOSEST SHAVE  
I EVER HAD, AND  
MY SKIN  
FEELS GREAT!



### BUBBLE PICTURES SHOW WHY



**MOST LATHERS** are made of bubbles too big to get to the base of the beard! Air pockets keep the soap film from reaching the whiskers. So the beard is only half-wilded.



**COLGATE RAPID-SHAVE CREAM** makes tiny bubbles that get clear down to the skin-line. Its rich soap film soaks your beard soft at the base. Makes your shaves last longer.

**NEXT TIME**

HOW NICE—  
YOU SHAVED  
AGAIN, BILL!

OH, NO I DIDN'T!  
THOSE COLGATE  
SKIN-LINE SHAVES  
LAST FAR INTO  
THE NIGHT!



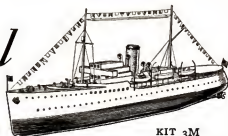
FOR SKIN-LINE SHAVES THAT  
LAST HOURS LONGER



**25¢** LARGE TUBE  
100 SHAVES  
**40¢** GIANT TUBE  
200 SHAVES

## New Kit for Building

# Nourmahal MODEL



KIT 3M

**M**INIATURE models now have a great appeal, especially for those who have only a few tools and who lack experience in craftwork. It doesn't take any special equipment to build small, simplified models, and the expense for materials is trifling, yet the models themselves are interesting and decorative, especially when built in sets so that one type of ship may be compared at a glance with another.

To encourage the building of miniature models in sets, we started our Model-of-the-Month series in 1934. The latest model in that series is Vincent Astor's famous yacht *Nourmahal*, on which President Roosevelt has made several trips. The model is 8 1/2 in. long and can be built on a kitchen table or even on a card table set up in the living room. The materials are contained in a special construction kit, prepared for the members of the Model-of-the-Month Club. Other readers, however, may take advantage of this kit and obtain it, so long as the supply lasts, for the same price, which is \$1.00, postpaid anywhere in the United States or Canada.

Other kits still available in the Model-of-the-Month series are given in the following list. If you would like to make a set of miniature models, an excellent combination would be the aircraft carrier *Saratoga* with her convoy of four destroyers (kits M and N), the modern cruiser *Taculosa* (R), and the liner *St. Louis* (O). All are built on the same scale—1 in. equals 50 ft.

Kits for our larger models are listed under the heading "Standard Ship Model Kits." Similar in general construction to our stand-

An 8 1/2-in. model of the yacht *Nourmahal*

ard models but much smaller and simpler are those marked "Simplified Ship Model Kits." Blueprints and instructions accompany all our kits. In each of our standard kits, the various pieces that make up the hull block have been sawed to the approximate shape in order to reduce the work of carving to a minimum.

### MODEL-OF-THE-MONTH KITS

|     |                                                          |      |
|-----|----------------------------------------------------------|------|
| M.  | Aircraft carrier <i>Saratoga</i> , 18-in.                | 1.00 |
| N.  | Four U.S. destroyers, each 6 1/2-in.                     | .75  |
| R.  | U. S. cruiser <i>Taculosa</i> , 11 1/2-in.               | 1.00 |
| U.  | <i>Hispaniola</i> , the ship in "Treasure Island," 7-in. | .50  |
| Z.  | H.M.S. <i>Bounty</i> , 11 1/2-in.                        | 1.50 |
| 1M. | Show boat, illuminated, 14-in.                           | 1.50 |
| 2M. | Ocean freighter, 14-in.                                  | 1.50 |
| 3M. | Yacht <i>Nourmahal</i> , 8 1/2-in.                       | 1.00 |

### STANDARD SHIP MODEL KITS

|     |                                                                                       |         |
|-----|---------------------------------------------------------------------------------------|---------|
| A.  | Whaling ship <i>Wanderer</i> , 20 1/2-in.                                             | \$7.40* |
| D.  | Spanish galleon, 24-in.                                                               | 6.95*   |
| E.  | Battleship U.S.S. <i>Texas</i> , 3-ft.                                                | 7.45*   |
| G.  | Elizabethan galleon <i>Revenge</i> , 25-in.                                           | 7.25*   |
| L.  | Farragut's flagship <i>Hartford</i> , steam-and-sail sloop-of-war, 33 1/2-in. hull... | 6.45*   |
| Q.  | Privateer <i>Swallow</i> , 12 1/2-in. hull...                                         | 4.95†   |
| V.  | Clipper <i>Sovereign of the Seas</i> , 20 1/2-in. hull                                | 4.95†   |
| Y.  | Trading schooner, 17 1/2-in. hull...                                                  | 4.90†   |
| 2S. | U. S. Destroyer <i>Preston</i> , 31 1/2-in. hull                                      | 5.95*   |
| 3S. | <i>Constitution</i> ("Old Ironsides"), 21-in. hull                                    | 5.95*   |
| 4S. | Clipper ship <i>Great Republic</i> , 31 1/2-in. hull                                  | 8.40*   |

### SIMPLIFIED SHIP MODEL KITS

|    |                                             |      |
|----|---------------------------------------------|------|
| F. | Liner <i>S.S. Manhattan</i> , 12-in.        | 1.00 |
| H. | Cruiser U.S.S. <i>Indianapolis</i> , 12-in. | 1.50 |
| J. | Clipper ship <i>Sea Witch</i> , 13-in.      | 1.50 |

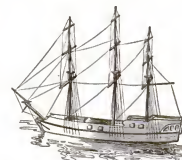
### MISCELLANEOUS

No. 4. Solid mahogany book trough 22 1/2 in. long, 9 1/2 in. wide, and 2 3/4 in. high over all. Ready to assemble, with finishes..... 5.30\*

No. 5. Solid rock maple hanging wall rack with one drawer, 19 1/2 in. wide, 3 3/4 in. high. Ready to assemble and stain included..... 5.75\*

No. 7. Whittling kit with two shaped blocks for making sea captain 5 1/2 in. high..... 1.50

NOTE: If you live west of the Mississippi River or in Canada, add 50 cents to all prices marked with an asterisk (\*) and 25 cents to all prices marked with a dagger (†). Otherwise all prices are postpaid anywhere in the United States or Canada. The kits marked with an asterisk or dagger will be sent C.O.D. in the United States upon request, but the purchaser will have to pay 28 cents additional.



KIT U—*Hispaniola* of "Treasure Island"



KIT 2M—Ocean freighter, 14 in. long



KIT 1M—An illuminated show-boat model

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Please send me Kit.....for  
which I inclose \$.....(or send C. O. D. ☐)

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City..... State.....

(Print name very clearly.)

Remit by money order, check, or registered mail. No kits selling for less than \$4.00 can be sent C. O. D. This offer is made only in the United States.



## LIGHTING YOUR PHOTOS

(Continued from page 71)

lamps. One lamp should always be placed closer to the subject than the other, and you should experiment with the height and angle of each lamp. Two lamps at roughly forty-five-degree settings also serve for small groups of two or three people or for a family group including one or two children. In the latter case the different heights of the subjects will help to keep the light from being exactly equal on both sides, but where you have three people in a single line you may run into this trouble. Get rid of it by having the center person turn his head slightly.

THE family group in Fig. 3 also illustrates a very useful trick in the use of photoflash bulbs. The baby and the little girl, who in this case happened to be an exceedingly lively specimen, made a snapshot exposure speed an absolute necessity. The set-up was made with two photoflash lamps in reflectors as in the diagram, and after they had been moved around to get the best average effect for the four subjects, the photoflash bulbs were removed and photoflash bulbs substituted. Both lamps were controlled with the same cord switch, so snapping the switch on after opening the shutter gave me an instantaneous exposure of about a fiftieth of a second. This was sufficiently fast to stop the little girl's head in a reposeful position, although she was wiggling around like a young eel.

If you have occasion to make a second exposure under such conditions, do not forget to snap the light switch to the off position before attempting to put in new flash bulbs.

The great advantage of this method is that it removes any uncertainty as to how the photoflash bulb will light the subject when you throw the switch. Of course, it's not necessary to use photoflash bulbs for the preliminary testing. One hundred-watt ordinary light bulbs will do as well.

If you are working with a battery-operated photoflash lamp and a drop cord and bulb are available, it is a good idea to make this light test. It often will reveal serious defects.

YOU will find a fascinating field in the exploration of dramatic lighting arrangements after you have become familiar with simple ways to set the lights. Back lighting often is very useful and adds an interesting touch to many a picture. Figure 1 shows a one-light and back-light picture. In this case, too, photoflash bulbs were used. Back lighting will serve to put a high-light where it will keep some portion of the subject from becoming lost in a dark background, to illuminate part of a face and produce interesting shadows, and often to give a halo effect to blonde hair. Note how, even with the decided brunette of Fig. 1, it adds to the effect.

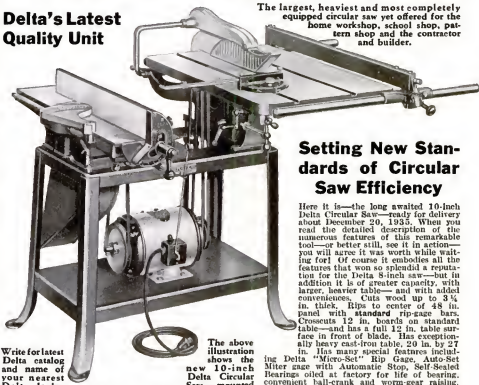
In using any back light, it is important to see that the light is so placed that it cannot possibly shine directly into the camera lens.

As both photoflash and photoflash bulbs may be operated in any position, it is possible to get extremely dramatic effects as on a stage by setting one or more lights near the floor to throw their light up at a sharp angle like footlights. Figure 4 shows one method.

Another useful trick to know about either photoflash or photoflash bulbs is how to use them as auxiliaries in your pictures. Suppose, for example, that you wish to photograph an interior with one person seated beside a reading lamp in the act of reading a book. As you view such a scene, the light from the reading lamp will appear as though it were turned off as soon as you use the far more powerful photographic lights. The answer to that problem is to substitute a photoflash bulb or in some cases a photoflash bulb for the ordinary reading light.

# New 10-in. DELTA CIRCULAR SAW

Delta's Latest Quality Unit



The largest, heaviest and most completely equipped circular saw yet offered for the home workshop, school shop, pattern shop and the contractor and builder.

## Setting New Standards of Circular Saw Efficiency

Here it is—the long awaited 10-inch Delta Circular Saw—ready for delivery about December 22, 1935. When you read the detailed description of the numerous features of this remarkable tool—or better still, see it in action—you will agree it was worth while waiting for! Of course it embodies all the features that won so splendid a reputation for the Delta 8-inch saw—but in addition it is of greater quantity, with larger, heavier table—and with added conveniences. Cuts wood up to 3 1/4 in. thick. Rips to center of 48 in. panel with standard rip-gage bars. Crosscuts 12 in. boards on standard table—and has a full 12 in. table surface in front of blade. Has exceptionally heavy cast-iron table, 20 in. by 27 in. Has many special features including Delta "Micro-Set" Rip Gage, Auto-Set Miter gage with Automatic Stop, Self-Sealed Bearings added at factory for life of bearing, convenient ball-cock and worm gear, lowering, and tilting, plus other features too numerous to mention. For full details write for 1936 Delta Catalog and Special Circular on 10-inch Circular Saw.

Write for latest Delta catalog and name of your nearest Delta dealer today.

The above illustration shows the new 10-inch Delta Circular Saw—mounted on a Special Combination Unit with the Delta 6-inch Jointer. Circular Saw is available separately as a bench model, or mounted on special stand, or in combination as shown above.



## New Shapers—New Grinders in 1936 "Delta" Line

The new Delta Shaper is one of the simplest and yet most complete Shapers ever designed for the workshop. Has numerous basic improvements. The new Delta Grinders are not just another line of grinders—but revolutionary new grinders in every sense of the word! Belt-driven, motor-driven and pedestal models—they all embody Delta's high standards of design and construction. No pains have been spared to make these new Delta Tools ideal in every way—convenient, safe, accurate and efficient. Truly, here are the grinders that shopworkers have always wanted—and at the unusually moderate Delta price levels.

## Write for New 1936 Catalog

It is crowded with photographs and information about the new line of 1936 Delta tools. It contains much valuable information that every man interested in motor-driven tools should have. It shows how Delta tools are built to stand the grind of production work. And yet are so low priced as to be within the reach of all, how they save time, money and labor—and quickly pay for themselves. Mail coupon without delay. Enclose only 10 cents at same time for Book No. 2 of "Practical Delta Projects," 32 pages of new and novel things to make, with numerous blue prints, working drawings, photographs and illustrations—and complete directions.

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MILWAUKEE, WISCONSIN.  
I enclose 10c (stamps or coin), for which please send me one copy of Book No. 2 "Practical Delta Projects." Also place me on your mailing list to receive 1936 Delta catalog of quality motor-driven wood-working tools.

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Address.....  
City..... State.....  
☐ Check here if you are a Delta user now.

If proof of Delta superiority were necessary for the craftsman who knows good tools, it would be afforded by the fact that the Delta Manufacturing Company is now the largest manufacturer in the world making this type of machinery exclusively.

## ALL HANDS PASSED



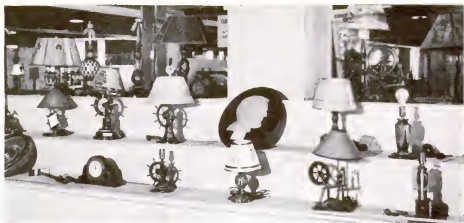
# OUT!

A FEW puffs dealt from that soggy pipe and rubber-tree tobacco ended the bidding. But a pipe cleaner and a tin of kind and sociable tobacco would put the game back on a friendly basis. No—we don't make pipes; but, folks, we do believe we offer the best-smelling blend of fragrant Kentucky Burleys ever laid before the noses of pipe lovers and their companions. Cooler and slower-burning, a 15¢ tin of Sir Walter Raleigh Tobacco lasts a pleasantly-long time. We think it's so darned superior we even wrap it in heavy gold foil for extra freshness. Better try it.

SWITCH TO THE BRAND  
OF GRAND AROMA



**FREE** booklet tells how to make your old pipe taste better, sweeten; how to break in a new pipe. Write for copy today. Brown & Williamson Tobacco Corporation, Louisville, Kentucky, Dept. Y-61



At the National Guild Exhibition this type of three-decked stand was used for small exhibits

## HINTS ON HOLDING Home Workshop Club Exhibitions



Official Magazine  
POPULAR SCIENCE  
MONTHLY

MANY newly organized home workshop clubs are now planning their first exhibitions. They can learn much from the experience of the older clubs in the National Homeworkshop Guild as reported in past issues of *POPULAR SCIENCE MONTHLY*. Innumerable pictures have been published of club exhibits, and these may be studied for ideas as to arrangement.

Exhibitions have a twofold importance and therefore should be planned very carefully. For one thing, they give the amateur craftsman an opportunity to see what the other fellow is doing, to compare his best efforts with those of men who follow the same hobby, and to progress more rapidly through the stimulus of competition. Only second in value to this, they arouse the interest of the public, encourage others to take up the invaluable pastime of making something with their hands, and bring new members into the club.

To insure success, the exhibition committee should have on it three of the most dependable and energetic club members, each in charge of one particular part of the work—location and arrangement, entries, and publicity. These three should be allowed to choose their own assistants and be given a free hand.

A well-located and easily accessible place should be chosen for the show. A vacant store on a main street is excellent. The local chamber of commerce, high school, library, or some club will usually be glad to provide the necessary space, and hardware stores and department stores are only too glad to cooperate as a rule. One thing the older clubs have learned is that they can obtain almost unlimited cooperation if they only ask for it.

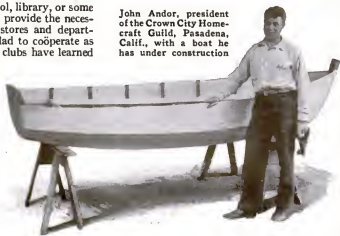
Entries should be limited to members of the club. It is not necessary to have a large number of exhibits to make an interesting showing, but each member of the club should display some piece of work and there should be as many different types of craftwork as possible. An entry blank should be

prepared with space for the exhibitor's name, address, telephone number, and description of the entry, with a release at the bottom to this effect: "I hereby release the.....Homeworkshop Club from any responsibility as to fire, theft, and accident, while the above articles are on display at..... (Signed)..... exhibitor." Such releases are common practice, so the club members should not object to signing one. The cost of the blanks, posters, labels, descriptive cards, and the like can be defrayed, if necessary, by charging a small entry fee.

There are various ways to identify the exhibits. One of the best is with a numbered sticker on each article. In one or more conspicuous places, a neatly lettered list may be posted showing the maker of each exhibit and his sale price if the article is for sale. It is most important, however, to avoid giving the impression that the exhibition is a disguised sale, and no price cards or advertising should be placed on any of the exhibits.

Two or three days is long enough for a club exhibition as a rule, although some of the larger clubs have exceeded that time. It is better to hold a brief show and have it well advertised in advance than a long one that cannot sustain the interest of the public. At

John Andor, president of the Crown City Home-craft Guild, Pasadena, Calif., with a boat he has under construction



least one member of the club should be present at all times to answer questions and watch the exhibits. Small pieces that might be picked up are best protected in glass cases, which usually may be borrowed for the occasion from some store or other organization. Cards should be placed here and there asking visitors not to handle the exhibits.

Much of the success of an exhibition depends upon adequate publicity. Start to build this up well in advance of the opening. Have photographs taken of the exhibition committee with one or two of the most striking exhibits and send them to the newspapers several days before the opening with a complete article about the exhibition. Reference should be made to the suggestions about publicity previously sent to all club secretaries by this magazine. Newspapers are invariably generous with space in connection with amateur craftwork exhibits, and good publicity will insure an encouraging attendance and adequate recognition of the club's work.

#### CLUB BREVITIES

**Atlanta (Ga.) Homecraft Club.** Now more than a year old, the club is in the midst of an active season that promises to be highly successful. By a coincidence, the first meeting of the 1935-1936 season in the Chamber of Commerce Building, was held, with twenty-five present, on the first birthday of the club. The secretary read the minutes of the first meeting for the benefit of those who had since joined the organization. Of the twelve charter members, seven were present at this meeting, and eleven are still members of the club. . . . To prevent the interruption in the officers' term of office which occurs because of the summer recess, the club's constitution was amended so that the election will hereafter be held on the first Thursday in October.

**Great Falls (Mont.) Homeworkshop Club.** With thirty-four members on the rolls and more in prospect, the club has its winter program well under way. It is working with one of the service clubs in making and repairing toys for children whose parents are unable to buy any, and each member has given himself the task of making several playthings.

. . . An attendance premium is now being given at each meeting. The first award was a projector made and donated by Fred B. Cook, the president; and a pair of small clamps were also given as a prize. These awards were won by Dr. A. J. Luckner and Kile Smith. . . . A number of instructive talks and demonstrations are being arranged by the program committee, which is composed of Dr. F. P. Silvernale, Arthur Moon, and E. S. Epley. . . . The membership has grown to such an extent that the homes of the members are no longer large enough for the meetings, and efforts are being made to obtain the use of the manual training room in the local high school.

**Crown City Homecraft Guild, Pasadena, Calif.** Much interest is being shown by club members in constructing small pieces of furniture of reed, rattan, and rush, such as taborettes, coffee tables, smoking stands, ottomans, and benches. John Andor is president of the club, and Frank F. Batsch, secretary.

**Mount Clemens (Mich.) Homeworkshop Club.** The forty members have been busy making toys for needy children. Officers for 1936 will be elected in February. Among the members are bankers, a district manager for the telephone company, pottery workers, finance men, druggists, hardware and wallpaper dealers, and a variety of mechanics, as well as the mechanical drawing teacher and the machine shop teacher of the local high school. Donald Gerkey is president, John W. Riley, Sr., secretary, and Carl Brandenburg, treasurer, of the club.

**Collingswood (N. J.) Homeworkshop Club.** A large poster advertising the club has been prepared for display in a local store window. William Strobern is head of the publicity committee. H. S. (Continued on page 95)



## THE GIFT TO CHEER HIS MORNINGS FOR MONTHS TO COME

SEARCH the gift counters—hunt for hours in the jostling Christmas shopping crowds and you couldn't find a more thoroughly acceptable gift at anything like the price of this attractive package of 50 Gillette "Blue Blades." Here's a gift that will cheer a man's mornings for months to come—assure him hundreds of clean, easy shaves.

The Gillette "Blue Blade," especially made for tender skin, is first choice of most men everywhere. It is the blade in demand—the most logical, practical gift

you can imagine. Make up your list now. Just write Gillette "Blue Blades" on your shopping list for men who "have everything" or are hard to please.

Most dealers have the special Christmas carton or can get it for you quickly. Save yourself endless steps and be sure of a warm reception for your gift. Ask your dealer for the Christmas carton of Gillette "Blue Blades."



## GILLETTE BLUE BLADES





# It's Right! MASONITE

Trade-Mark Reg. U. S. Pat. Off.

THE home-craftsman expects a lot from the bookcases, radiator covers and other things he builds. He wants them to be beautiful and serviceable. He wants them to be admired. He wants them to last for years . . . and, at the same time, be *inexpensive*.

There's one way to accomplish these aims — by building them the *right way* . . . with the *right materials*.

Genuine Masonite TEMPERED PRESWOOD is an ideal material for home-craftsman. It is available from leading lumber dealers everywhere. It is always uniform in thickness and quality. It's absolutely grainless. Easy to cut and saw into any size or shape. Contains no glue or artificial binder to dull the finest edges. It will not warp, chip, split nor crack. Joints stay fitted permanently.

This modern material is a beautiful warm-brown color. Produces pleasing, artistic effects without further treatment. If desired, it can be varnished, painted or enameled with any standard application.

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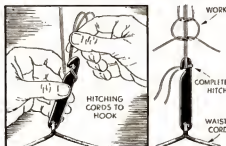
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## SPECIAL HOOK SPEEDS UP KNOT WORK

THOSE readers who have become interested in square-knot work through the many articles on that subject by Kenneth Murray will find that a belt hook made as shown from an old toothbrush handle enables one to secure and cast off the "standing" cords much more quickly than is possible with the conventional type of wire hook. The notch can be made with a jackknife and file. The hook is fastened about the waist with a cord.

A little practice will enable one to secure the two cords upon which the knot is to be tied by means of a simple jam hitch, as illustrated. The hitch can be kept from slipping by leaning back slightly.—A. R. SAUNDERS.



The hook is made from an old toothbrush, and the "standing" cords are merely hitched to it.

## BLUEPRINTS FOR HOME WORKSHOP USE

### A SHIP MODEL for CHRISTMAS

THERE'S still time to make one if you start right away. But choose something very simple. For example—

A beautiful little balsawood water-line model of that famous ocean liner *St. Louis*. Full-size blueprint, 25 cents. Construction kit with blueprint, \$1.00.

A full-hull model  $\frac{1}{4}$  in. long of Vincent Astor's power yacht *Nourmahal*. Blueprint, 25 cents. Kit with blueprint, \$1.00.

SUCCESS in any home workshop depends largely upon having good plans to work from. Since 1922 we have been publishing blueprints especially prepared for amateur craftsmen. The following is a selected list, but many other projects are available. Send a self-addressed, stamped envelope for our complete list.

### RADIO SETS

|                                               |    |
|-----------------------------------------------|----|
| All-Wave Portable (battery), 217-R.....       | 50 |
| Amateur Short Wave Receiver, 155.....         | 25 |
| Amateur Radio Transmitter, 183-184.....       | 50 |
| Five-Tube Short Wave (A.C. or D.C.), 223..... | 25 |
| Full Electric Headphone Set, 110.....         | 25 |
| One Tube (battery operated), 103.....         | 25 |
| Screen-Grid Set, 109.....                     | 25 |
| Short-Wave Converter Unit, 137.....           | 25 |

### FURNITURE

|                                             |    |
|---------------------------------------------|----|
| Chests, Treasure, 78.....                   | 25 |
| Child's Coucher, 179A.....                  | 25 |
| Coffee Table with Spiral Legs, 245A.....    | 25 |
| End Table, American Empire, 241A.....       | 25 |
| Floreside Seats (wood and metal), 268A..... | 25 |
| Flare Lamp with Tripod Base, 243A.....      | 25 |
| Magazine Rack, Ladder-Back Style, 285A..... | 25 |
| Miniradio, 50 by 30 in., 246A.....          | 25 |
| Pier Cabinet and Hanging Shelves, 77.....   | 25 |
| Screens, Modernistic Folding, 91.....       | 25 |
| Sewing Cabinets, Two, 31.....               | 25 |
| Smoking Stand, Modern, 238A.....            | 25 |
| Stool, Upholstered, 240A.....               | 25 |
| Table, Four-Leaf Card, 239A.....            | 25 |
| Tables, Tile-Top, 249A.....                 | 25 |
| Tavern Table and Scroll Mirror, 105.....    | 25 |

### SHIP AND COACH MODELS

|                                                                                                                            |      |
|----------------------------------------------------------------------------------------------------------------------------|------|
| { Construction kits are available for<br>{ some of these models. See page 72. }                                            |      |
| Aircraft Carrier—U.S.S. <i>Saratoga</i> (18-in.)<br>and flush deck destroyer (6½-in.),<br>226-227-R.....                   | 75   |
| Battleship—U. S. <i>Texas</i> (3-ft. hull),<br>197-198-199-200.....                                                        | 1.00 |
| Bottle, Clipper Ship in, 121-122.....                                                                                      | 50   |
| Civil War Ship <i>Monitor</i> , <i>Herrmann</i> and<br><i>Hartford</i> (3¼, 5½, and 5½ in. long<br>respectively), 258..... | 25   |
| Clipper Ship (20½-in. hull), 51-52-53-R.....                                                                               | 1.00 |
| Clipper Ship <i>Great Republic</i> (3½-in. hull),<br>272-273-274.....                                                      | 25   |
| Constitution (21-in. hull), 57-58-59-R.....                                                                                | 1.00 |
| Cruiser <i>Brooklyn</i> (8-in.), 236.....                                                                                  | 25   |
| Cruiser <i>Tuscaloosa</i> (11¼-in.), 234.....                                                                              | 25   |
| Freighter, <i>Ocean</i> (14-in.), 271.....                                                                                 | 25   |

|                                                                                             |      |
|---------------------------------------------------------------------------------------------|------|
| <i>Galleon Revenge</i> (25-in.), 206-207-208-209.....                                       | 1.00 |
| <i>Hartford</i> , Farragut's Flagship (33½-in.<br>hull), special prints 221-222-R.....      | 1.50 |
| H. M. S. <i>Bounty</i> (8½-in. hull), 254.....                                              | 25   |
| <i>Mayflower</i> (17½-in. hull), 43-44-45-R.....                                            | 1.00 |
| Motor Boat, 29-in. Cruiser, 61-64-R.....                                                    | 75   |
| Motor Boat, Working Model (20-in.), 196.....                                                | 25   |
| <i>Nourmahal</i> , power yacht (8½-in.), 276.....                                           | 25   |
| Linier— <i>Aquitania</i> (9-in.), 225.....                                                  | 25   |
| Linier— <i>California</i> (12½-in.), 251.....                                               | 25   |
| Linier— <i>Normandie</i> (20½-in.), 264-265.....                                            | 50   |
| Linier— <i>Manhattan</i> (12-in. long), 204.....                                            | 25   |
| Linier— <i>St. Louis</i> (11-in.), 231.....                                                 | 25   |
| Privater of 1812— <i>Swallow</i> , a Baltimore<br>clipper (18-in. hull), 228-229-230-R..... | 1.00 |
| <i>Santa Maria</i> (18-in. hull), 74-75-76-R.....                                           | 1.00 |
| Show Boat, Illuminated (14-in.), 263.....                                                   | 25   |
| Stagecoach with horses, 144-145-146-R.....                                                  | 1.00 |
| Steamboat, Mississippi (19½-in.), 94-95-96-R.....                                           | 1.00 |
| Trading Schooner (17½-in. hull), 252-253.....                                               | 50   |
| "Treasure Island" <i>Hippaniola</i> (7-in.), 237.....                                       | 25   |
| Viking Ship, (20½-in.), 61-62-R.....                                                        | 75   |
| Whaler— <i>Wanderer</i> (20½-in.), 151 to 154.....                                          | 1.00 |
| Yacht <i>Rainbow</i> (7½-in. hull), 237.....                                                | 25   |
| Yacht <i>Sea Scout</i> (45-in. racing), 106-107-R.....                                      | 75   |
| Yacht (20-in. racing), 48-R.....                                                            | 50   |

### TOYS

|                                              |    |
|----------------------------------------------|----|
| Doll's House, Colonial, 72.....              | 25 |
| Doll's House, Furniture, 73.....             | 25 |
| Projector for Photos and Pictures, 259A..... | 25 |
| Toy Airplane Cockpit with Controls, 114..... | 25 |
| Toy Birds and Animals, Jig-Sawed, 56.....    | 25 |
| Toy Drill Press, Lathe, Saw, etc., 101.....  | 25 |
| Toy Dump Truck, Fire Engine, etc., 101.....  | 25 |

### MISCELLANEOUS

|                                                                              |    |
|------------------------------------------------------------------------------|----|
| Bird House, Log-Cabin, 244A.....                                             | 25 |
| Hand Loom, Four-Treadle, 268A-269A.....                                      | 75 |
| Knitting Bag with Wooden Frame, Hooks,<br>Ends, and Collar Holder, 267A..... | 25 |
| Microscope Kit, Portable, 220.....                                           | 25 |
| Night Lamp and Sewing Kit, 255A.....                                         | 25 |
| Perpetual Star Chart, 214.....                                               | 25 |

### BOATS

|                                                                                     |      |
|-------------------------------------------------------------------------------------|------|
| *Canoe, 16-ft. Canvas-Covered Kayak, with<br>sail, etc., 192-193-194-R.....         | 1.00 |
| *Duck Boat, Folding, 170-R.....                                                     | 50   |
| High-Speed Boat for Small Outboard Motors<br>(7 ft. 11 in. long), 287.....          | 25   |
| Installing Inboard Motors, 270.....                                                 | 25   |
| *15½-ft. Runabout or "Sportboat" (outboard<br>or inboard motor), 175-176-177-R..... | 1.00 |
| *13-ft. Utility Rowboat (can be sailed or<br>used with outboard motor), 224-R.....  | 50   |
| *13-ft. Racing Runabout, 261-262-R.....                                             | 75   |

Note: Full-size patterns for any boat marked with an asterisk (\*) will be drawn to order for \$1.50 extra.

### Popular Science Monthly 353 Fourth Avenue, New York

Send me the blueprint, or blueprints, numbered as follows:

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## SPANISH SILVER CHEST

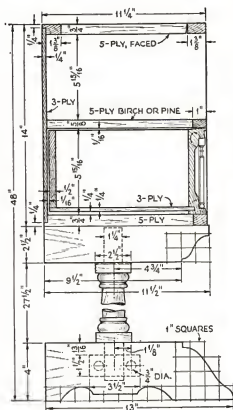
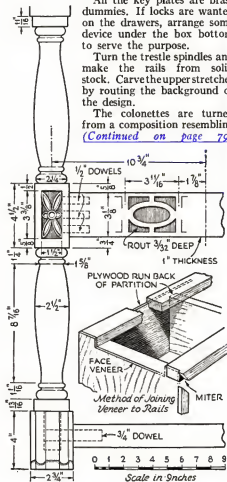
(Continued from page 62)

grooves made with a rough three-cornered file decorate the edge moldings. Shallow V-lines on a flat surface form the border and background around the center panel.

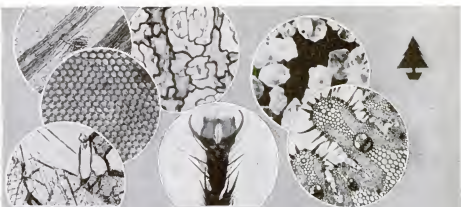
All the key plates are brass dummies. If locks are wanted on the drawers, arrange some device under the box bottom to serve the purpose.

Turn the trestle spindles and make the rails from solid stock. Carve the upper stretcher by routing the background of the design.

The colonettes are turned from a composition resembling  
(Continued on page 79)



The end view, partly in section; and, above, the leg detail and sketch of box construction



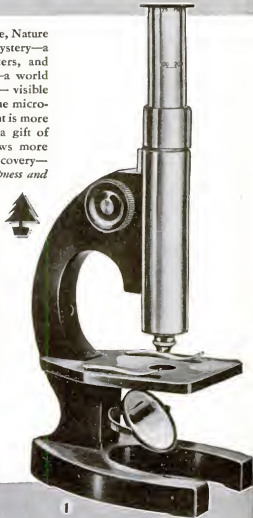
## For Christmas . . . NATURE'S WONDERLAND



Hidden from the unaided eye, Nature has concealed a world of mystery—a world of grotesque monsters, and delicate fairy-like beauties—a world of breath-taking adventure—visible only through the magic of the microscope. Microscope equipment is more than just a Christmas present, it is a gift of permanent pleasure, a gift that grows more valuable with each fascinating new discovery—but only if the microscope has the sharpness and clarity that scientists demand.

Made by the same skilled workmen who produce the famous Bausch & Lomb microscopes for medicine, science and research, Bausch & Lomb Amateur Microscope equipment is made to that fine precision which alone can give the sharp detail essential in microscopy. 1—Model R Microscope, 72 to 300 diameters, in walnut case and with 455-page book, \$21 (Book alone, \$7.50). 2—New Gem Microscope, 72 to 150 diameters, in walnut case and complete instruction manual and Course of Experiments (20,000 words), \$14.50. 3—Gem Science Kit, complete portable microscope laboratory, \$9.50; with New Gem Microscope, \$24.00. 4—Micro-Projector, \$18.50. 5—Photomicrographic apparatus, \$12.50. Send 10c for valuable booklet, "Microscope Hints."

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# A 2-Minute Job



## PLASTIC WOOD Fills Cracks in Baseboards, Floors

Now . . . it's no work at all to make many repairs yourself—broken furniture, fill cracks, nicks and holes in wood, fasten loose drawer pulls, casters and bathroom fixtures, cracks around bathtubs, etc.—with this scientific product called Plastic Wood. Users say it handles and shapes as easily as putty—and quickly dries to hard, permanent wood that “stays put” on wood, metal, plaster, stone, glass and porcelain.

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You can drive nails and screws into genuine Plastic Wood without it splitting or crumbling—you can paint it, carve it, finish it just like real wood—for inside or outside work, as it is waterproof and weather-proof. To be sure you have the genuine—look for the name Plastic Wood on the container. Paint and hardware stores sell it in 25c tubes and 35c cans. Keep Plastic Wood handy. It will save you a lot of time and money.



## RADIATOR INCLOSURES EASILY MADE



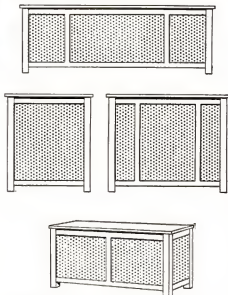
UNCOVERED house-heating radiators not only are unsightly in themselves, but they also cause marks to appear on the wall paper. Radiator inclosures overcome these faults. Good ones are somewhat expensive to buy, but the home craftsman can make them himself at little cost.

After the measurements have been determined, start by cutting a piece of 3 by 4-in. white pine studding to length and rip four legs from it. Plane these and lay out with pencil the position of the rails. A 1/4-in. space is left between the top and top front rail to allow free circulation of warm air. Next rip the rails and stiles to width and sand absolutely square to length. It is sometimes advisable to divide the front into two or three panels for strength, economy in cutting the metal “cane,” or beauty of design.

Now bore for 3/4-in. dowels and glue the pins in the rails and stiles. This form of joint was selected because it is strong and easy and quick to make, especially if a homemade doweling jig is used as shown. The grooves for the cane and for the solid panel in the back are cut on the circular saw. If the radiator is located too close to the wall to permit the 3/4 by 1 1/2-in. rail to fit behind it, fasten a piece of No. 28 gauge galvanized sheet

iron across the back legs of the inclosure. The back, in any event, must be closed tightly to force the warm air away from the wall and prevent warm-air streaks above the radiator.

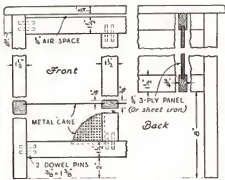
Cut the perforated sheet-metal “cane” with tin shears to the correct sizes. Assemble and glue the framework together. While the glue is drying, get out a piece of 3/4-in. white pine for the top, allowing a 1/4-in. overhang on front and ends. Fasten two close-fitting battens with screws on the underside to prevent



Suggestions for cabinets of various shapes

warping and to hold the top in position. Sometimes it is advisable to fasten the top permanently to the body with angle irons to prevent twisting. Now remove the clamps from the body, smooth the joints, and put 1/4-in. rounds on all the sharp corners.

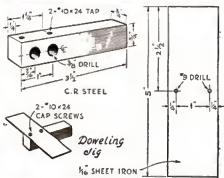
When finishing the radiator inclosures, first give the end grain and sap streaks two coats of shellac, then apply two coats of good quality flat paint, and finish with two coats of enamel.—ALFRED J. WILLIAMS.



Typical construction of an inclosure. Note the 1/4-in. air space above the top front rail



Cabinet fronts may be divided as in this instance, or left plain as in the upper photo



Method of making and using the boring guide

## ALL 3 ARE LePAGE'S

So many crafty craftsmen use Le-Page's, that we have to make three kinds—each built for strength.

**LePAGE'S LIQUID GLUE**  
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**2 Waterproof!**



**LePAGE'S LIQUID SOL-DER**—Every craftsman has so many jobs for a drop or two of liquid solder that he'll find it a real help in his shop. It works almost like magic.

You can get them from your hardware dealer.



**RUSSIA CEMENT COMPANY**  
Laboratories and Factory - Gloucester, Mass.

## SPANISH SILVER CHEST

(Continued from page 77)



The lid gives access to a compartment for table linen, and the drawers hold silverware

ivory, such as an ivory-colored cast-resin plastic, or from brass, the surface of which is dimmed in a flame and lacquered.

Use only a flat finish for this cabinet. If an antique finish is desired, fill with rottenstone and wax; and for further effect, touch up the carving with a little gilding.

Equip the lid with two ornamental brass hinge hasps about 1 1/4 in. wide, at each end, and add corresponding hinge leaves at the bottom of the box. A strong brass handle placed a little above the center on each end completes the piece.—EDWIN M. Love.

## NAUTICAL BOOK ENDS

(Continued from page 63)

sized pattern, transferring it to the smoothed wood, outlining with a chisel, and cutting away the waste to the lower level (about 3/16 in. deep). The contours of the design are then carved. The high parts are the top of the head, breast, center of legs, and edge of one wing on the eagle; the rim and center part of shield; center of the rope; inner end of the anchor stock and the fluke on the opposite side, and, of course, the molding all around. The feathers and other patterns are then cut with a V-chisel (or knife) and a small flat chisel.

The pattern can be alike on both book ends, but it is more shipshape if it is reversed on one. They can be antiqued or not, as you please. A wax finish is the best pleasing.

The base plates may be flat pieces of any stiff metal, held in position with three screws, countersunk into the metal.—P.O'N.

## GRIP FOR SCREW DRIVER



Very small screw drivers are somewhat difficult to manipulate, but the grip can be improved by slipping a rubber ball over the handle. A ball such as is used in faucets of the Fuller type is just the right size for this purpose.—WILBUR ENNIS.

## MAN... LOOK AT THESE PRICES ON GENUINE BLACK & DECKER ELECTRIC DRILLS



**THE NEW 1 1/2" JUNIOR:** Drives twist drills for drilling up to 3/8" holes in steel; augers for drilling up to 1 1/2" holes in wood. Also drives hole saws for cutting clean, round holes, from 3/4" to 3 1/2" diameter in wood, metal or composition. A husky, he-man tool that will make quick work of so many tough jobs you'll wonder how you ever got along without it. Universal motor. Real Black & Decker quality. A really great drill at a really small price. . . . Only \$35.00

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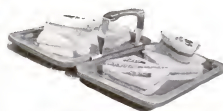
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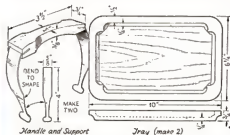
## WOODEN SANDWICH TRAY FOLDS IN HALF



The tray loaded with sandwiches and another view to show how it is folded to be put away

fastened to the edges of the two trays, and the handle supports are put in place and fastened in the slots in the ends of the handle with escutcheon pins.

If the wood is walnut, a paste filler should be used to fill up the pores. If a close-grained wood such as maple has been used, the filler should be liquid, or the wood may be filled



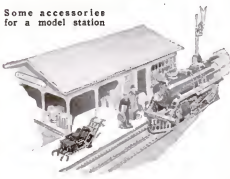
Top and edge views of the tray parts, detail of handle support, and the assembled handle

with a coat or two of varnish. After filling, the wood should be finished with waterproof varnish or several coats of oil, rubbed in to make it waterproof. This will prevent the surface from absorbing moisture.

When the tray is open, it lies flat on the table, and the weight of the two halves keep them in that position when lifted by the handle. When not in use, it folds up flat like a book and can be tucked away in the cupboard in a very small space.—D. C. MARSHALL.

## MINIATURE LUGGAGE FOR MODEL RAILWAYS

Some accessories for a model station



NOW that woodware is so popular, any craftsman can utilize his woodworking tools to make a useful and up-to-date folding sandwich tray.

Cut the stock to size and square up the edges and ends. Hollowing out the inside is the next step. The first part of this work is done with a router bit in the drill press. The drill must be run at high speed to make it cut smoothly, and the routing should be continued clear out to the edge of the molding. When the inside has all been routed out, a carving bit is substituted for the router, and the molding around the inside edge is cut. This finishes the inside of the tray except for scraping and sanding the bottom.

The outside corners of the tray are now rounded, ready for the finishing cut, which also is made with a shaper cutter on the drill press. The chuck is removed from the press and a shaper adapter spindle is put on in its place.

The handle supports are made of brass, copper, or nickel silver, as preferred. They are cut to some shape similar to that shown in the drawing. The narrow neck fits between the two halves of the tray, and the wide ends keep it from slipping through in either direction. The handle itself is cut on the jig saw and finished with a roll sander in the flexible shaft or in the lathe.

As shown above, small brass hinges are

REALISTIC trunks, hand luggage, and boxes for use on station platforms of model railways can easily be made from blocks of wood, broom handles, and inner tubes.

For trunks, cut 1-in. square softwood into 134-in. lengths, round off the corners and edges, and paint the pieces dark brown or black. Cement on handles cut from an old inner tube, and represent the brass fittings with a good grade of gold paint. Some small paper labels of different shapes and colors may be pasted on for greater realism. Trunks of other sizes, of course, can be made in the same way.

Boxes are made similarly, but painted a light cream color. The boards and graining are then indicated with black lines applied with a very fine brush. A few knot holes may be painted, and a label pasted on each end.

Valises of the round type are merely small sections cut from a round stick, flattened to make them stand up. They are painted black, and handles and labels added in the same manner as for the trunks.—JAMES J. ECKEL.

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|             |      |
|-------------|------|
| White metal | 10c  |
| White metal | 15c  |
| White metal | 20c  |
| White metal | 25c  |
| White metal | 30c  |
| White metal | 35c  |
| White metal | 40c  |
| White metal | 45c  |
| White metal | 50c  |
| White metal | 55c  |
| White metal | 60c  |
| White metal | 65c  |
| White metal | 70c  |
| White metal | 75c  |
| White metal | 80c  |
| White metal | 85c  |
| White metal | 90c  |
| White metal | 95c  |
| White metal | 1.00 |

**Stock Anchors**

|             |      |
|-------------|------|
| White metal | 10c  |
| White metal | 15c  |
| White metal | 20c  |
| White metal | 25c  |
| White metal | 30c  |
| White metal | 35c  |
| White metal | 40c  |
| White metal | 45c  |
| White metal | 50c  |
| White metal | 55c  |
| White metal | 60c  |
| White metal | 65c  |
| White metal | 70c  |
| White metal | 75c  |
| White metal | 80c  |
| White metal | 85c  |
| White metal | 90c  |
| White metal | 95c  |
| White metal | 1.00 |

**Boats**

|             |      |
|-------------|------|
| White metal | 10c  |
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| White metal | 20c  |
| White metal | 25c  |
| White metal | 30c  |
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| White metal | 45c  |
| White metal | 50c  |
| White metal | 55c  |
| White metal | 60c  |
| White metal | 65c  |
| White metal | 70c  |
| White metal | 75c  |
| White metal | 80c  |
| White metal | 85c  |
| White metal | 90c  |
| White metal | 95c  |
| White metal | 1.00 |

**BLANKS**

|             |      |
|-------------|------|
| White metal | 10c  |
| White metal | 15c  |
| White metal | 20c  |
| White metal | 25c  |
| White metal | 30c  |
| White metal | 35c  |
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| White metal | 45c  |
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| White metal | 55c  |
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| White metal | 65c  |
| White metal | 70c  |
| White metal | 75c  |
| White metal | 80c  |
| White metal | 85c  |
| White metal | 90c  |
| White metal | 95c  |
| White metal | 1.00 |

**Double**

|             |      |
|-------------|------|
| White metal | 10c  |
| White metal | 15c  |
| White metal | 20c  |
| White metal | 25c  |
| White metal | 30c  |
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| White metal | 65c  |
| White metal | 70c  |
| White metal | 75c  |
| White metal | 80c  |
| White metal | 85c  |
| White metal | 90c  |
| White metal | 95c  |
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To mold the outer edge of each tray section, a drill press with a shaper cutter is used



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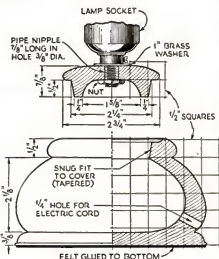


This lamp has a hiding place for trinkets

INCLOSING a secret compartment, this attractive trinket lamp provides a case for jewels, trinkets, coins, or any small articles one wishes to keep hidden.

The base is turned from a block of black walnut 3 by 5 1/2 by 5 1/2 in., which may be glued up from three 1-in. pieces. If the block is glued up, align the pieces so that the direction of the grain is the same throughout. The cover is turned on a faceplate and made a snug, wedged fit. The screw holes by which it is fastened to the faceplate are hidden by the brass washer, which is peened before assembly.

Almost any lathe-applied finish for walnut may be used. A coat of paste filler followed by several coats of linseed oil, rubbed in, will give a pleasing, dull gloss. Blotter paper may be substituted for the felt base. The shade may be purchased at a ten-cent store.—DELMAR W. OLSON.



Drawings of the lamp base. Variations in the design may be worked out to suit yourself

**SMOOTHING SMALL CARVINGS**

WHEN model parts are hand carved and afterwards painted, a good trick is to coat the surfaces with waterproof casein glue. When this is dry, it can be sanded down to a smooth, even finish that covers all carving marks.—O. B.

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A fully planked grade crossing over a double main track with cattle guards (see drawings below)

# MINIATURE Crossings and Signs

## IMPROVE A MODEL RAILWAY

By J. W. CLEMENT

ANY long stretch of model railway track that seems bare or uninteresting can be improved by adding a highway grade crossing with its various signs.

Figure 1 on the facing page shows some of the most common signs. The drawing is almost self-explanatory, but the following specifications, copied from the original plans, may be helpful: "Posts to be of round cedar, stripped of bark, not less than 6 in. in diameter at the top. Posts and boards to be painted white with black lettering. Crossing signs to be lettered on both sides and posts to be striped black and white." These specifications apply to all of the signs except the whistle post and mile post shown at F and G, Fig. 1. These two signs are of metal, the posts usually being made of old boiler flues, and the boards of boiler plate. Both signs are painted white with black letters. The whistle post should be

lettered with a large W on one side only.

In making the wooden signs, use dowel sticks for the posts, and for the signboards either white cardboard or the thin wood found in berry boxes or safety-match boxes. White cardboard such as is used for business cards has its advantages: it doesn't have to be painted, will not split, and takes drawing ink nicely.

As to location, signs B, C, D, F, and G should be placed 10 ft. to scale from the near rail and at right of the track. For the crossing signs the specifications read as follows: "One sign only shall be placed at the grade crossings of unimportant highways over one track. Where two signs are required, place one on each side of the track on the right-hand side of the highway unless local conditions require left-hand location. [See sketch H and K, Fig. 1.] Signs to be placed as near highway as possible and not more than 75 ft. from nearest rail."

Figure 2 shows the details of a plank grade

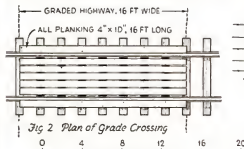
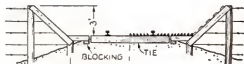
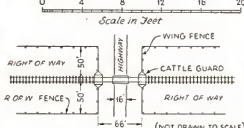


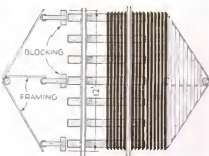
Fig. 2 Plan of Grade Crossing



Elevation of Cattle Guard  
Fig. 3

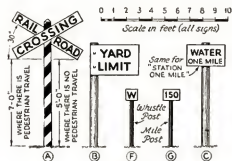


Location Sketch Showing Right of Way,  
Fencing, Highway Crossing and Cattle Guards  
Fig. 5

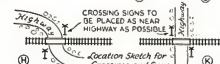


Plan of Cattle Guard  
Fig. 4

Planked crossing and cattle guard, and a diagram showing the arrangement at a typical crossing



Standard railway signs. The posts for B, C, D, and E are 8 ft. above the ground; F and G, 4 ft. 6 in. Refer to the scale for all other sizes



crossing, usually 16 ft. wide. At unimportant crossings where there is little travel, such as farm crossings, only four planks are used. These are placed one at each side of each rail, and the center between the planks is merely filled with gravel.

If your right of way is fenced, it will be necessary to add cattle guards as shown in Figs. 3 and 4. The drawing is made in detail, and it will probably be necessary to simplify the actual construction to some extent. For instance, if your road is built to a scale of  $\frac{1}{4}$  in. to the foot, the slats would be only  $\frac{3}{32}$  in. in height. This is entirely possible, of course, but your passenger trains will run just as fast and the freight trains haul just as much freight if these finer details are omitted.

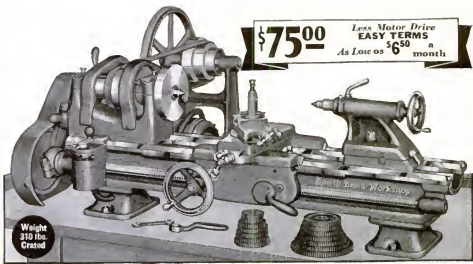
Build the wing fences as shown in Fig. 5 and be sure to keep the wings of the cattle guard well "whitewashed."



A planked grade crossing over a branch line with one crossing sign and a "Station One Mile-Water" sign at the right of the track

#### TIRE PUMP BLOWS DUST FROM HOLES DRILLED IN CONCRETE

WHEN drilling holes in concrete floors with star drills, the concrete dust and chippings must be removed if satisfactory progress is to be made. A good way to do this is to blow the dust out with an automobile-tire hand pump. This method avoids the disagreeable splashing that accompanies the use of water for the same purpose.—LOUIS N. GOODMAN.



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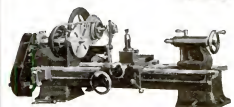
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The list of materials at the end of this article is for a case to fit a popular thin-model camera, but the dimensions may be altered to suit any camera. When changing the plans, be sure to allow a little for the lining.

First obtain a sheet or two (depending on size) of sole leather such as used by shoemakers when half-soleing shoes. Two sheets are preferable because it is hard to find one sheet of uniform thickness, which is the prime requirement in this work. The leather used for this particular case was about 5/32 in. thick, but the lid was made only 1/4 in. larger (instead of 5/16 in., which would be twice the thickness of the leather), thus making a snug fit. The leather was purchased from a mail-order house and, with the remainder of the materials, cost less than two dollars.

After laying out a full-size plan, cut each piece of leather with a sharp knife or a discarded razor. Bevel the inside edge of each to an angle of 45 deg. with the exceptions of the end pieces that form the top of the case and the bottom of the lid. This is best done with a sharp block plane and a guide built to hold the pieces at the correct angle, as shown in Fig. 1.

With a gauge, mark off a line  $7/32$  in. from the edge along each side of

each piece where it is to be sewed. Include the square edges on the case, but not on the lid, which is not to be lined. With a sharp knife or razor, make a shallow cut along these gauge marks, and with an old glass cutter spread the leather apart in these seams. This will make the leather bend below the surface. With a homemade tool fashioned from an old clock gear, proceed to mark holes for sewing in each seam as shown in Fig. 2. See that each piece is marked with the gear wheel so that it will match the adjoining piece when placed in position for sewing. This can be done in either of two ways, and by working both ways from it, and by doing the same with the pieces that are to join it.

Lay each piece on the 45-deg. board that was used when beveling, as shown in Fig. 3, and with a small awl held perpendicularly, continue to punch holes through the leather in each of the marks left by the wheel. Along the edges of the pieces that form the top of the case, however, the holes should be punched through straight for fastening the lining.

At this point cut out of a more pliable and lighter grade of (Continued on page 85)



Fig. 1. A wooden guide for holding the leather at a 45-deg. angle while the edges are being beveled with a small plane



Fig. 2. Holes for sewing may be marked quickly with a tool improvised from a discarded clock gear.

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MOULDS

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| <input type="checkbox"/> 3 Little Pigs... 50c                              | <input type="checkbox"/> Donald Duck, 50c | <input type="checkbox"/> Baby Mickey, 50c |
| <input type="checkbox"/> I enclose 3c stamp for CATALOG. (Free with order) |                                           |                                           |

NAME \_\_\_\_\_



## DURABLE CAMERA CASE

(Continued from page 84)



Fig. 3. The guide used for beveling is merely turned upside down when punching the holes

leather the hinge and the leather strips for holding the carrying-strap rings. These must be sewed on now as it is almost impossible to do so later when the case is completed. The hinge should be so placed that the lid extends down over the case  $\frac{1}{2}$  in. When sewing, use two needles and a silk finish linen thread, doubled and well waxed. Insert one needle from one side and the other through from the opposite side, and pull the thread taut at the end of each stitch. Fasten the case together temporarily with a few stitches and proceed to sew.

A snap fastener, obtainable at a shoe shop, serves admirably for the lock. The front piece of the lid may be tapered on the sides to give a better appearance. The shoulder strap, which is a strip of leather about 54 in. long, is fastened to the rings, or a shorter strap may be attached to form a handle.

The finishing touches consist of lining the case with some soft material, preferably black wool flannel. Cut and sew to the right size to make a snug fit when shoved down in the case. Sew the lining to the case around the top edges where holes were previously punched. An application of shoe polish, rubbed to a high luster, will give a rich-looking finish.

### List of Materials

| No. of Pieces | Description    | T.   | W.    | L.    |
|---------------|----------------|------|-------|-------|
| 2             | Front and back | 5/32 | 4 1/2 | 7 3/8 |
| 2             | Sides          | 5/32 | 2     | 7 3/8 |
| 1             | Bottom         | 5/32 | 2     | 4 1/2 |
| 1             | Front of lid   | 5/32 | 2 3/4 | 4 3/8 |
| 1             | Top of lid     | 5/32 | 2 3/4 | 4 3/8 |
| 1             | Back of lid    | 5/32 | 1     | 4 3/8 |
| 2             | Sides of lid   | 5/32 | 1     | 2 1/4 |
| 1             | Hinge          | 3/8  | 1     | 3 1/2 |
| 2             | Ring straps    | 3/8  | 5/8   | 3 1/2 |
| 1             | Shoulder strap | 3/8  | 3/4   | 54    |
| 1             | Snap fastener  |      |       |       |
| 2             | 5/8-in. rings  |      |       |       |

NOTE: All dimensions are given in inches.

### REFLECTOR FOR A TOY TRAIN

A METAL reflector taken from a worn-out flash light makes an efficient reflector for a toy electric train headlight. Remove the reflector from the flash light, and screw it on the base of the headlight bulb. The bulb with the reflector attached can then be screwed into the light socket in the electric engine. Such a reflector will also serve in converting a simple post light, used in connection with a toy electric train system, into a brilliant flood light.—GEORGE A. SMITH.

HEAVY brown paper glued around the edges of a stack of boards will hold them together while being cut on the scroll saw or band saw. If the outside parts are to be used, they can be separated easily by using a razor blade.—C. L.

# How Dangerous Is The BLACK WIDOW SPIDER ?



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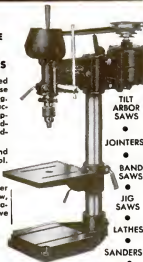
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## How to add **DECK FITTINGS**

# TO THE **GREAT REPUBLIC**

By Capt. E. Armitage McCann

Captain McCann setting up the two funnels on the second deck house, one for the galley stove, the other for the donkey engine

**I**N HER day, when she was America's largest clipper ship, the *Great Republic* was called the "ship of ships." She was not only large, but remarkably beautiful—an ideal subject for a ship model. Our new model of her was carried along in last month's issue as far as the completion of the hull, and we can now start the deck fittings.

Her upper deck was on one level, fore and aft. All accommodations were below this deck. The crew of a hundred men and thirty boys lived in the upper between-decks. The dining saloon alone was 30 by 14 ft.

The deck plan published last month shows the position of all deck furnishings, and the profile plan and details, their appearance.

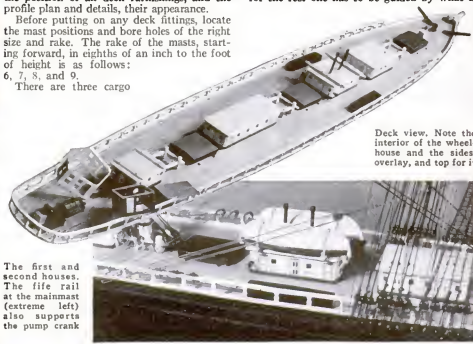
Before putting on any deck fittings, locate the mast positions and bore holes of the right size and rake. The rake of the masts, starting forward, in eighths of an inch to the foot of height is as follows: 6, 7, 8, and 9.

There are three cargo

hatches, all alike. They can be made of wooden blocks, slightly crowned longships and undercut at the sides to represent where the tarpaulins are turned over the edges. There is also a hatch on either side, similar to the others but long and narrow.

The forward house is a shelter house and sick bay; the next contains the galley, smith's shop, and donkey engine; the third is the officer's mess hall and staircase to quarters; the fourth is a staircase and smoke room, and the last is the wheelhouse.

We know the dimensions of these houses, that there was a plank left off around them for ventilation, and that they were white, but for the rest one has to be guided by what is



Deck view. Note the interior of the wheelhouse and the sides, overlay, and top for it

The first and second houses. The life rail at the mainmast (extreme left) also supports the pump crank

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probable, so I have added the essentials.

I made them all of solid blocks, with slightly rounded corners. For the windows I cut in a little, rubbed on some blue pencil and a drop of cellulose cement to represent the glass; over this I placed No. 32 brass wire bars, pressed into saw cuts. The scale is very small for applying moldings, so, for the panel effect, I glued on pieces of three-ply Bristol board from which I had cut the windows, panels, door panels, and ventilation slots. I then gave the whole a coat of white paint. The roofs are separate pieces of thin board, cut to overlap the sides. The coamings (heavy timbers, bolted to the deck beams, on which the houses are built) are represented by strips of cardboard, painted brown and glued on



View looking down on the bow to show where the anchors are placed and various details

after the houses are set in position. If the deck has been lacquered, fasten everything to it with cellulose cement.

The second house has half doors, a funnel for the galley stove, and another for the donkey engine, which was the first ever placed on a sailing vessel. According to some accounts the 15-h.p. engine could be moved about the deck for working cargo or hoisting sails, or even be placed in a huge longboat and fitted with a propeller to tow the ship. With this in mind, I have given it the usual drums projecting from the house and have made large doors in the after end of the house, so that it could be trundled out.

On the forward end of the first house and after end of the fourth, I placed racks of capstan bars. These are wires rove through slips of wood and glued to the houses. The bars should be light brown.

The steering gear in the wheelhouse, so need not be made, but I preferred to show it and built the house of thin wood (1/16-in. three-ply) with open doors and windows, and placed that over the gear. Inside there is a gear box, two 5-ft. (to scale) steering wheels, and a binnacle; across the front I placed a red-covered settee, which steadies the house; on the floor is a grating. On the fore-side is hung the small bell.

Right forward I placed a companionway to the crew's quarters, and on it I put the forward bell, which has to be handy to the lookout man. The bracket is twisted wire, with its ends stuck in the companionway.

It seemed to me that there should also be a cabin skylight, so I put one abaft the spanker mast. This has a half-round top and a seat on either side. I made the half-round glass as for the other windows, drilled holes down at their edges, and, to represent the bars, wound thin wire over the "glass" and through the holes. This should be mahogany color.

The Great Republic had two large iron Allyn capstans, one on the quarter-deck and one forward. These I first turned, leaving spindles to glue into the deck, and then dug out the spaces between the whelps, as shown in the detail drawing. I painted all the deck ironwork green. (Continued on page 88)



## I'LL SAY YOU OUGHT TO HAVE A NEW FLEXIBLE FLYER

But I haven't time to tell you ALL about it now!

I want to take my own Flexible Flyer out on the hill — and let the other fellows see some speed.



I got my sled last year — and it's a honey! But say — I wish I had one of the new Airline Eagles. That's even better looking than Dad's new streamlined car and it's a pippin!



Ma's more interested in the Safety-Runners. Dad thinks the Super-Steering is a knockout!

But say — I'm quitting right here — Me and my FLEXIBLE FLYER are going places — Here's hoping you get yours!



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## (Continued from page 87)



The windlass was on the second deck.

The life rails are supported by the sheet bolts, which are square posts set well into the deck; they have three sheaves, for top rail sheets and topping lifts. Onto their forward sides are half-lapped the extending cross-brs. Set into their after sides are the life rails proper, which at the fore and mizzen have their after ends half-lapped to cross-rails. Under the corners are turned posts, with nails through the rails and posts into the deck. At the mainmast the rails extend to the house in order to support the pump crank, and they have turned posts at the middle and half posts glued to the house.

The pumps consist of two pieces of small tube set into the deck, a bent-wire cranked to the rails, and wire rods. The flywheels can be cut from metal or celluloid or soldered together of wire. The handles are unshipped when not in use. The wheels are more usually inside the file rails as shown on the plans, but are outside on my model because I happened to have a pair of suitable wheels of the other type. The pump wheels are scarlet.

There should be six crab winches under the rigging, presumably for hoisting sails and the like. These would probably be much as shown, with an iron framework, supporting a double handlebar on which is a cogwheel turning a larger cogwheel fixed to a wooden barrel. I made these from 1/32-in. fiber and wire, nailing them to the deck through their feet.

There are two 30-ft. (to scale) lifeboats, bottom up, on skids on a forward house. The ship also carried two 26-ft. quarter boats, probably a whaleboat and a longboat, and a 22-ft. captain's gig, which I put on chocks on the after house. (Continued on page 80)



Rail, wheelhouse, and other details at the stern. These also appear in the upper photo



## 89

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## MUSSELMAN DOENUT CORD

## PUPPET HEADS MODELED FROM PULP

(Continued from page 57)



**Boldly modeled fairy-tale head with rope hair**

a medium as clay, if these suggestions are followed

The paste should not be worked in until shortly before pulp is to be used. The longer the paper itself soaks in water, the better. It seems to ripen. My own practice is always to keep a pail of it on hand. It remains sweet and fresh for a long time if there is no paste in it.

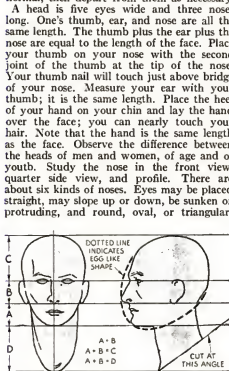
Puppets should be made individually, and the bodies varied according to the heads. It is, therefore, advisable to make a rough drawing of the whole figure. Width of shoulders, length of torso, and length of arms and legs vary with different types. Character is also shown in the hands and the size of feet, which should be made to correspond with the head and body.

The human head is about a seventh of the height of the whole figure. That its character may be seen, the puppet head is generally larger—one sixth of the height. If larger than this, it may dwarf the body, giving the effect of a midget. If, on the other hand, it is made less than one seventh of the height, the figure will appear heroically broad and tall.

For a large audience in an auditorium, 24-in. puppets are large enough. For living-room groups, the figures should be smaller, detail greater, and coloring more delicate. Large puppets must be broadly treated, colors vivid and every detail emphasized. Reduce the face to fewest and simplest lines. Eliminate all nonessentials. Then the face will seem to change expression with proper lighting and the mood of the play. Only extreme simplicity can achieve this result.

The foundation for the head, or "armature" as it is called, is a stick, such as the end of a broomstick, with a wad of paper tied around the end. While modeling, it is advisable to fix the end of stick in a vise at an angle. Even better is a heavy block of wood about 6 by 6 by 6 in. with a hole bored in it at an angle, just off the vertical, to hold the stick. A cross section of a log of wood answers the purpose.

ing the space between eyes and chin gives a line for end of nose and lobes of ears. Halfway between this and the chin is marked for the mouth. The throat is the length of the face and almost as wide as the face. Familiarize yourself with these proportions, which are normal, then depart from them as necessary.



Front and side views of an ideal head. This is the foundation for modeling any character

Ears also vary greatly. The ears of old men appear very large. Chins are normal, projecting, receding, pointed, or round. Faces are often narrow across forehead and broad across jaws, or vice versa, if not normal.

Models everywhere! Every human being is a model for a puppet. Look at the outline of faces, especially the jaw line. Notice the curve of eyebrows. Note the planes that catch the light and those that cast the shadows. Watch the shape of faces under different emotions.

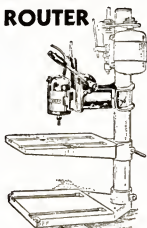
Start with an average head. Having formed a good oval and marked the lines, press with the thumbs to form sockets for eyes, making both at once. Press more deeply toward the nose. Next make small depressions each side of the mouth line, adding pulp to mold the lips. Add a lump of pulp for the nose and model it. If necessary, add more pulp to brow and cheek; this depends upon the face you are copying. Work a little on one side and then on the other, keeping your form balanced. Never finish one side or one feature at a time. The chin will probably need more pulp. In adding pieces of pulp, work and press them into the face so that they are of the same consistency because small amounts of pulp dry out more quickly than does the head. Very large noses may be modeled over beads or nails. In Pinocchio, for instance, a straight 2-in. brad is driven in and the pulp worked around it.





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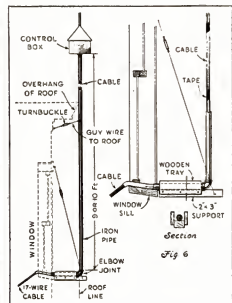
## WEATHER VANE REGISTERS ON DIAL

(Continued from page 59)

track for the rotating switch (Fig. 3).

Obtain from a plumbing shop a 10-ft. iron pipe, 1-in. inside diameter, and cut a piece 1 ft. long from it. Have one end of the short piece threaded, as well as both ends of the longer piece. Screw an elbow joint onto the end of the latter. The short piece should then be cut to a length sufficient to correspond to the overhang of roof where the vane is to be mounted.

Measure the approximate distance from the position the control box will assume on the roof down through the house to the place the dial is to be hung, and multiply this by seventeen, giving the footage of wire needed. Before



The iron pipe supporting the vane rests in a wooden trough attached to the window sill

buying the wire, add on to your estimate enough footage to cover the distance from the dial to the current source, (a 6 to 5-volt bell-ringing transformer or batteries) and back. Bell or annunciator wire is all right for this purpose (18-gauge).

In some convenient place, lay the wire out in the required lengths, seventeen pieces in all. Bind these together with tape every few feet and mark one wire at various intervals to be used as the lead-in wire. Then feed one end of this cable through the short and long lengths of iron pipe before screwing the short one into the elbow joint. The top of the longer pipe goes through a hole in the bottom of the control box, and is fastened by a large nut and washer on each side.

Fun the end of the cable out in the control box and arrange so that each of the large segments may have a wire soldered to it. Tape the wires where they enter the pipe at both ends. Then solder the seventeenth or lead-in wire to the thrust bearing, or if you used a whole bicycle hub, to the lower end of the hub, making it possible for the electricity to flow from the current source up the lead-in wire, through the thrust bearing to the brass arm, out over the hinge and through the brass arm of the revolving switch, down whichever segment it is lying on, to the corresponding light in the dial, through the switch near the dial and back to the current source.

The dummy segments are used in the segment table to prevent the switch from resting on two live or large segments at one time and so lighting two bulbs in the dial, with consequent dimming of both. They also serve, of course, to make a continuous track for the switch so as to insure very smooth operation.

Complete this part of your instrument by screwing on one of the remaining sides of the control box and make a sliding door (Fig. 3B) of the other side, with overlapping joints to keep out the weather. The door should be covered with sheet lead wide enough to extend over the joints. These projecting edges should be arranged to slide in grooves formed by the lead casing of the box and extra pieces soldered on along one edge.

The pipe supporting the vane rests in a wooden trough attached to the attic window sill by a hinge, and held up by two galvanized iron wires tightened with turnbuckles. The pipe is held to the roof about 4 ft. up with two more wires and turnbuckles. It will be necessary to cut a slot in the bottom of the window frame to admit the cable, which is covered with sheet lead from the end of the pipe to the inside of the window sill. The method of supporting the vane is made clear by a drawing in the preceding column (Fig. 6).

Paint the whole assembly with two coats of enamel, using white to reflect the light and thus reduce the heat. Add an appropriate initial or insignia to the vane if you wish.

The construction of the dial will be described and fully illustrated in next month's issue.



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## MODERN PIPE RACK AND TWIN HUMIDORS

(Continued from page 65)

thickness of cylinders, due to a taper of several thousandths of an inch required in casting. The best method to follow, therefore, is to turn the notch very carefully, testing periodically with the cylinder section. A close fit is essential because a humidur should be reasonably air-tight.

THE next step is to cut two 3/4-in. sections from the cylinder on a band saw or a circular saw, or by hand with a hack saw. Be certain the cut is exactly at right angles to the side walls of the cylinder. Sand the cut edges smooth. One of the best ways is to use a flat revolving sanding disk in the lathe. The cylinder should be laid in a wooden carriage—a block of wood with two strips nailed to it will do—so that it can be moved along the lathe bed toward the sanding wheel.

The two 7-in. rods that form the lower part of the pipe rack are attached to the base with small screws, rising through countersunk holes in the base plate. The position of the rods will depend on the shapes of the pipes you intend to use with the rack. In the instance shown, the forward rod was set 1/2 in. back from the front edge of the base, and the second rod 1 in. from the first.

The third rod is cut up to form the crossbar and the two cover handles. The crossbar is 3/4 in. long, and its ends are shaped with a round file to conform to the curve of the cylinders. The ends should be drilled to a depth of about 3/4 in., and holes of equal diameter should be drilled in the two tubes. Here again, the exact height of the crosspiece will vary with your pipes. In the model illustrated, the holes in the tubes were drilled 2 5/8 in. above the base.

Since it is difficult to countersink holes on the inside of a tube, screws cannot be used to fix the cross piece. However, a satisfactory joint may be made by dipping sections of match stick in glue and setting them in place like dowels. Of course, small hardwood joints or metal pins will make a stronger joint.

Each tube is fastened to the base with four screws. Holes must be drilled and countersunk in the base, and other holes drilled in corresponding positions in the tube. Drill the tube by using the holes in the base as a jig.

AFTER all the holes are drilled, cut two waxed paper disks of the same diameter as the tubes, place them between the tubes and base, and then work all four to an air-tight fit.

Two types of operations have not yet been described—polishing and decorating. Both should be performed before any of the assembly operations, but after all of the construction steps have been taken. Polishing (described in detail in P. S. M., Nov. '35, p. 60) calls for two steps: First, buffing on a high-speed muslin disk wheel. Pumice, mixed with water to a mudlike consistency, is used as the polishing agent. Second, dry polishing with Carnauba wax or a good, clear powdered floor wax. A final buffing on a clean wheel will bring out a high, lasting gloss.

Decorative operations may vary. Some craftsmen will prefer the clean, modern effect illustrated, without any carving or turning. Others may wish to turn concentric bands on the cylinders (see P. S. M., Dec. '35, p. 100).

In that case, mount the tubes on a round, softwood mandrel set between centers of a lathe and proceed as in wood turning. Spindle carving may be used to decorate the covers, the knobs, or even the base.

Another consideration is the choice of color. Solid colors available in cast resins range all the way through the rainbow.

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## HOME WORKSHOP CLUBS

(Continued from page 75)

Callahan, manual training teacher in the local high school and a member of the club, gave a talk and demonstration on the operation of lath saw, planer, and lathe at a recent meeting held in the workshop of Michael J. Rudolph, president of the club.

**Easton-Phillipsburg Homeworkshop Club**, Easton, Pa. At the organization meeting of this new club, with twenty-four members present, the following officers were elected: Edward McCuskey, president; W. P. Watson, vice president; F. M. Beale, secretary-treasurer.

**Brantwick (Me.) Homeworkshop Club**. At a recent meeting in the Manual Training Building, the members listened to a discussion of fine cabinetwork by Lincoln Clough, of Durham. He placed special emphasis on sharpening tools, and exhibited several unusual examples of craftsmanship, including a violin.

**Edison Homeworkshop Club**, Chicago, Ill. The club was recently invited to make use of a model home workshop set up in a hardware store at 1224 Belmont Avenue, and one meeting has already been held there. . . . A talk on "Woods and Their Uses" was given at a previous meeting through the courtesy of one of the leading craftsman service companies.

**Western Springs (Ill.) Homeworkshop Club**. This newly organized club got under way with thirteen members. The president is H. E. Shore and the secretary-treasurer, E. L. Whistman.

**Club des Artisans Amateurs, Trois-Rivières, P. Q., Canada**. A demonstration is to be given at the rate of one a month on the following subjects: tool sharpening, wood finishing, wood turning, soldering, taxidermy, electrical hints, clock repairing, and decorating. At a recent meeting J. C. Boissoneault exhibited a smoking stand, and Albert Ricard a crucifix.

**Peekskill (N. Y.) Homeworkshop Club**. To facilitate the work of repairing old toys for distribution at Christmas, the Drum Hill School workshop was kept open on Tuesdays and Thursdays under the supervision of Harry L. Towers, the manual training instructor, who is also secretary of the club. The members have been busy preparing for the annual contest and exhibition, with five competitive classes—furniture, model making, novelties and toys, metal work, and art.

**Maple City Homeworkshop Club**, La Porte, Ind. A competition of one-evening projects has been started. The members bring in their entries at every second meeting. The club meets twice a month. . . . The members, who number thirty-one, recently paid a visit to the industrial arts shops of the local high school.

**Fargo (N. D.) Homeworkshop Guild**. It is not unusual to have all twenty-nine members of the club and several visitors present at a regular meeting, which is evidence of sustained interest in the club's activities. The meetings are held in a basement room of a local hardware store. Among the members are a mill workshop operator, a contractor, a carpenter, and the assistant superintendent of a foundry, all of whom have workshops at home as a hobby. . . . Recent programs included demonstration on sharpening hand saws and circular and band-saw blades by T. Oetby, Chris Sorenson, and O. M. Mickelson, members of the club; on using a jointer for bevelling table legs and cutting rabbets, and on making bow joints and diagonal cuts on the circular saw.

**Chickasaw Homeworkshop Club**, Memphis, Tenn. The club has materially increased its membership as the result of an exhibition given at the Mid South Fair in Memphis. The management provided a space 14 by 22 ft. free of cost, in which the club placed home workshop machines borrowed from local dealers, a workbench, a selection of hand tools, and various projects made by members.

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We are interested in facts, not literary ability, but please write clearly, completely, and keep your letter within 500 words. We are not looking for "get-rich-quick" stories or freak adventures, and authors must be prepared to substantiate the truth of the statements. Manuscripts submitted and printed become the property of this magazine, and we are not responsible for the return of rejected stories unless sufficient postage is provided for this purpose. Address your contribution to Success Story Department, POPULAR SCIENCE MONTHLY, 353 Fourth Avenue, New York, N. Y.

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## Secrets of Success

work and while I used to think I would rather commit suicide than spend the rest of my life at manual labor, still I could never seem to accumulate the \$5 needed to start the home study course.

When our family moved to Arizona in 1924, my father's financial position was somewhat better and he insisted that I go back and at least finish high school, which I did in 1925. Upon graduation, I obtained employment with one of the local copper mines in the capacity of laboratory assistant in the assay office which paid 48 cents an hour.

I tried to interest myself in chemistry because that was the job, but I soon realized that my life work couldn't lie in that direction. Having enough money saved by December of that year, I returned to my first inclination, electricity, and enrolled for the course which had inspired me five years before.

Soon after starting my studies, I endeavored to obtain a transfer to the electrical department of the company for which I was working, but as they had no openings, I was unable to effect the change. When I had completed about half the course, I saw there would never be any chance of getting into electrical work with this outfit so I quit the laboratory and applied to the chief electrician of another large mine.

It so happened that he needed an electrician's helper but wanted an experienced man. Unfortunately, of course, I couldn't qualify as such but I told him about the home study course I had been following and to my surprise I got the job. That was early in 1926 and the job paid 52 cents an hour with lots of overtime which brought the wages up to about \$140 a month, working every day.

My rise was not meteoric but it was steady with frequent wage increases and added responsibilities until at the end of two years and a half I was a full-fledged electrician earning at that time from \$200 to \$300 a month. What gave me the most satisfaction was the fact that I was selected for many jobs requiring skill and knowledge for which so-called "practical" men, with many more years experience, were overlooked.

I worked until January 1933 when this company was obliged to suspend all operations. Like a good many others in this country I was forced to go on the dole; either that or leave home and all that I had acquired in this neighborhood (having married and bought a home) and seek problematical employment elsewhere. Even under these conditions my home study training stood me in good stead as I was able to obtain many small jobs which brought me in more than I had received on relief while others, with no technical training, were forced to subsist on the pittance they received from the Government.

In June 1934, the mine resumed operations on a very small scale but I was one of the first to go back to work. I am now employed steadily as mine electrician while two of the older "practical" men, whom I used to help, are working as "trouble shooters" with irregular employment and for less money.

While this is not intended as an un-



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## Secrets of Success

usual success story, it does give the plain, unvarnished facts of my career for the past thirteen or fourteen years and should make apparent to any one that his financial and working conditions can be improved through the devotion of a little time and serious study to the pursuit of one of the many excellent home study courses offered today.

—O.B.L., Miami, Arizona

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Radio was pretty much in the experimental stage when J.M.B., of Bruceton, Tenn., first became interested in it. Like thousands of other mechanically-minded young men he tinkered with it as a hobby; tried out the various new circuits and gadgets as they came along; made sets for himself and his friends and kept them in order.

Then, as radio swept the country and new stations were opening up here, there and everywhere, J.M.B. began to see vast possibilities in radio as a career. Other people were finding jobs in this fascinating new industry. Why couldn't he? He could, with a little more knowledge of radio, so he made up his mind to acquire it.

"I wasn't financially able to attend a resident school," writes Mr. B., "so I took a home study course from a well-known school in New York. From this I really learned the fundamentals of radio, got the code well in hand and passed the Government test for the operation of a 'Ham' station. By the time I had completed the radio course, I finished high school and obtaining the backing of a local man, went into the servicing business.

"I put in a line of electrical appliances, radios, refrigerators, washing machines, etc., and did servicing work. Next I purchased a service car and equipped it with a public address system. I then started picking up advertising jobs.

"Although I live in a small town, I have a good territory and am making a good living—servicing, selling and advertising. I attribute my success to my home study course and have never regretted for one minute the time, effort and money I put into it."

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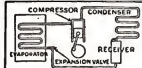
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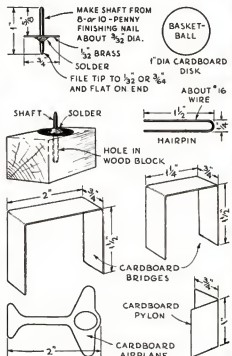
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## NEW WALKING-TOP GAME

(Continued from page 64)

last pin, he must release it and walk off the end of the board the same as after each other turn. If a pin is walked off the board, it must be returned. The hairpins may be widened into a "V" if the game is found too difficult at first.

In the "basketball" game, the cardboard disk is placed in the center and each player in turn tries to push it into his opponents "basket" (the circle at the end). It must be pushed entirely within the circle. After each turn at pushing the ball, a player must walk back and off the end of the board or the



The top, the block used for soldering, and a variety of suggestions for making accessories

other player gets two turns. The ball goes into play each time where the other player left it.

It is interesting to note how quickly or slowly people learn to control the top because it involves the development of a new set of nervous and muscular reactions with which they have been previously unacquainted. In the same way a person learning to drive a car or fly an airplane must develop a new set of reactions.

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# VINCENT ASTOR'S YACHT NOURMAHAL

(Continued from page 61)



propeller shafts into holes drilled at the stern. Paint the hull white above the water line and deep maroon below. Use painter's masking tape (or other gummied paper tape) to keep the division line clean and sharp. The water line is 9/16 in. from the keel. The exposed portion of A that represents the deck aft should be painted light buff, while the edges of C are to be painted white.

The stanchions around the after deck are small pins inserted at 1/4-in. intervals, cut so that only 3/8 in. protrudes above the deck. Paint these stanchions white. Then shape G and glue it to the hull. If the stanchions were carefully cut, the edge of G should just touch the tops of the stanchions. Paint the top of G light buff, and the edge where it matches the hull, white.

The shape of the deck houses is shown in the drawings. Two pieces 1/2 in. thick are used wherever 1/2-in. wood is required. The bulwarks of thin cardboard must be fastened with great care. All the superstructure units should first be assembled and painted, then attached to the hull.

The large ventilators are made from half mustard seeds attached to shaped dowel supports. The small ventilators are small pins (1/2-in. preferably) with heads bent over sharply. The construction of the windlass, from two eyelets and wire, is shown in a sketch. Eyelets are also used for hawse lips, and the anchors are cut from fiber or cardboard and glued to the lips. The deck chests U help support the cardboard bulwark.

The funnel is shaped from the 3/8-in. dowl into an oval cross section. The funnel tops are then cut from fiber and affixed. One is exactly the shape of the funnel, the other slightly larger. The funnel is buff, with black top. The masts are made by tapering the thin dowl sticks and inserting them into the hull after painting.

There are three lifeboats of whaleboat de-

sign, one speed boat (which should be finished with mahogany stain, though maroon paint may be substituted), and two launches with small covered cabins. These are glued directly to G after painting. The davits are shaped from thin wire and inserted into the side of the hull, then bent sharply against the hull.

The awning over the deck aft (beyond G) is cut to shape from thin card or heavy white paper, and glued to the underedge of G for support. It should rest evenly on the pins used for stanchions.

The screws are made from fiber or, if available, thin metal. They are pierced with a pin, which is then inserted as far as it will go into the tubing used for the propeller shafts.

The rigging is held in place by drops of clear cement. The pennants are made simply by folding over the thread a number of small oblongs of colored paper, which are cut into pointed or swallowtail shapes with a small pair of scissors after the glue that holds them in place has dried. In the absence of colored paper, use white paper and touch up the pennants with water colors after they are in place. The United States flag, at the stern, can be made similarly and colored.

## List of Materials

| WHITE PINE, BASSWOOD, OR BALS | No. of Pieces | Length | Width | Thickness | For |
|-------------------------------|---------------|--------|-------|-----------|-----|
| 1                             | 8 1/2         | 1 1/2  |       |           | 1   |
| 1                             | 3 1/2         | 1 1/2  |       | 3/32      | B   |
| 1                             | 3             | 3/4    |       | 1/8       | C   |
| 2                             | 1             | 9/16   | 1/4   | 3/32      | D   |
| 2                             | 2             | 1 1/2  | 1/4   | 3/32      | E   |
| 1                             | 3 1/2         | 1 1/2  |       | 1/32      | F   |
| 1                             | 1 1/2         | 3/4    |       | 1/8       | H   |
| 1                             | 1 1/2         | 3/4    |       | 1/8       | I   |
| 2                             | 2             | 1      | 1/2   | 1/8       | K   |
| 2                             | 2             | 1      | 1/2   | 1/8       | M   |
| 2                             | 2             | 1      | 1/2   | 1/8       | N   |
| 2                             | 2             | 5/16   | 3/8   | 1/8       | O   |
| 2                             | 2             | 9/16   | 3/8   | 1/8       | P   |
| 2                             | 1             | 3/4    | 3/4   | 3/32      | R   |
| 2                             | 3             | 3/16   | 3/16  | 1/32      | T   |
| 2                             | 2             | 3/8    | 3/8   | 1/8       | S   |
| 2                             | 2             | 3/8    | 1/16  | 1/16      | U   |

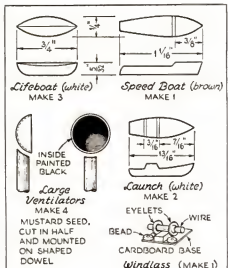
## FIBER

|   |       |        |      |   |
|---|-------|--------|------|---|
| 1 | 6 3/4 | 1 1/2  | 1/64 | G |
| 1 | 1 1/2 | 1 1/16 | 1/64 | J |
| 1 | 1     | 1/16   | 1/2  | L |
| 1 | 1     | 3/8    | 1/64 | Q |

NOTE: All dimensions are given in inches. Use scraps of fiber for funnel tops, rudder, etc.

## MISCELLANEOUS

- 1 pc. 3/4-in. round dowl wood 3/4 in. long for funnel.
- 1 pc. 1/16-in. round dowl wood 12 in. long for masts, ventilator supports, crow's nest, etc.
- 2 strips of thin white cardboard about 6 in. long and 1/4 in. wide for bulwarks, rail, etc.
- 1 pc. thin white cardboard about 3 by 1 1/2 in. for awning, etc.
- 5 doz. pins 3/8 in. long for stanchions, small ventilators, etc.
- 3 ft. stiff thin wire for davits, yards, etc.
- 2 pc. 1/16-in. tubing (brass or aluminum) about 2 in. long for propeller shafts.
- 2 pins about 1 1/2 in. long for propeller supports.
- 6 eyelets (smallest size) for hawse lips, windlass, etc.
- Some small smooth mustard seeds for ventilator covers.
- A small spool of No. 100 black thread for rigging.
- Scraps of colored paper (rumpled preferred) for flags and pennants.
- Black, white, buff, and deep maroon paint (or black, white, and red alone can be made to serve as they may be mixed together, white predominating, to give a tint resembling buff).
- Glue or cement.



Details of the three lifeboats, speed boat, two launches, large ventilators, and windlass





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## MAKING AN INEXPENSIVE VACUUM PUMP

(Continued from page 67)

are produced. After the vacuum which the pump is drawing becomes high, the mercury falling in the pump will produce loud clicks whenever the mercury hits the glass. This is known as the "mercury-hammer" effect, and the sharp clicks are caused by lack of air to cushion the impact. As the mercury is being poured from the bottle into the funnel, static electricity can be heard snapping and crackling. Sometimes the friction of the mercury falling down tube B will produce a beautiful phosphorescent glow, depending on the vacuum in the pump. This glow may be seen more easily if the room is darkened.

The following experiments merely scratch the surface of the interesting work possible with this vacuum pump, but they will serve to familiarize the amateur with the pump and some of its varied uses.

Did you know that the snow-white sugar found on the table had any connection with a vacuum pump?

It has—in the refining process the raw sugar solutions must be evaporated. These solutions normally boil at well over 200 deg. F., but this heat chars the sugar. To overcome this difficulty, a vacuum pump is used to lower the boiling point of the sugar solutions.

To demonstrate just how the boiling points of liquids are lowered,

fill a test tube one third full of water and connect it to the pump with a section of rubber tubing, a 90-deg. glass tube, and a one-hole rubber stopper. When a vacuum is drawn, seal the test tube from the pump and hold a lighted match under the tube. At once the water will boil violently! Yet if the stopper is quickly removed, the boiling water of a moment ago will hardly be warm when poured into the palm of your hand. This experiment also explains how it is possible for a person in the mountains to wash with boiling water that would produce painful burns at sea level. Alcohol will boil from heat of the hand alone. Heat the end of a 6-in. piece of glass tubing in the flame till it closes. When cool, pour in a little alcohol, evacuate the tube, and seal it. By holding the tube in your fingers for a few moments, you can start the alcohol boiling.

When performing these experiments, seal the connection and remove the tube entirely from the pump, otherwise some vapor will enter the pump and decrease its efficiency. The method used is as follows: Before connecting the outlet tube with the pump, stretch it down to a very small diameter. Later, a little heat applied to this drawn out portion of the tube will enable it to be pulled completely apart at this point, sealing off the tube without admitting any air.

The now familiar neon tubes, used in signs of many colors, require rare gases that are difficult, if not impossible, for the amateur to obtain, but the more common gases such as oxygen, hydrogen, nitrogen, carbon dioxide, and also mercury, water, and iodine vapor give equally interesting results. Methods of preparing the gases are easily obtained from literature on the subject.

To make a tube of glowing light, first obtain an old Ford spark coil. The coils can be bought cheaply at an auto-wrecking yard. Cleaning the vibrator points and adjusting the vibrator on the coil will often improve results. Use a transformer at 6 volts to supply current for the coil. The "button" near the



Admitting carbon dioxide gas by pressing the rubber tubing into the mercury-filled funnel

vibrator is both the high- and low-voltage terminal, and the "button" at the opposite end from the vibrator is also low voltage. A number of glass T-tubes, costing a few cents each at a scientific supply house, are also needed.

A wire connection is fused into two of the T-tube's openings; the third is connected with the vacuum pump. Ordinary wire cannot be successfully fused into glass tubing, so a special wire must be used. This can be obtained from a discarded radio tube or light bulb by breaking the glass portion and melting the solder that holds the special wire to the base. When a few short lengths are obtained, seal two of them into the T-tube by heating an end till it is nearly closed, inserting the wire into the small hole, and again heating the glass until it grips the wire.

Each gas or vapor introduced into the T-tube before it is evacuated will affect the nature of the high-voltage discharge. The introduction of a drop of mercury or water or a bit of iodine crystal proves interesting when it vaporizes. Heating the T-tube will help the discharge to pass.

For the first attempt at producing a gas-discharge tube, ordinary air can be used for the gas. When the crackling 1/2-in. spark of the Ford coil is harnessed in the tube, it is transformed into a beautiful purple glow, about 5 in. long, as it noiselessly passes through the rarefied air in the T-tube.

To experiment with some particular gas in the T-tube, the tube is first evacuated and then the gas is introduced, indirectly, through the funnel at the top of the pump. The newly admitted gas will lower the vacuum in the T-tube too much for the discharge to pass, so the tube must be evacuated again, whereupon the characteristic color of the gas will appear when the high-voltage is shot through.

Provided the pump has been perfectly constructed, an ultrahigh vacuum may be obtained, if the T-tube being evacuated is carefully heated while the vacuum is being drawn. When this so called X-ray stage is reached, cathode rays are produced that cause the glass T to exhibit fluorescence of various colors. Uranium glass will produce yellow, iron glass green, and lead glass blue.

Liquids are also fluorescent, and if the outside of the tube is painted with eosin (red aniline dye), quinine sol., kerosene, aesculin sol., or uranine (yellow aniline dye), this fluorescence may be easily seen. Certain chemicals, particularly crystalline sulphides, will phosphoresce under the action of the electrical discharge when placed in the tube, showing how radiant matter may produce visible light.

When working with high vacuums, seal all connections with sealing wax and use only the best grade of heavy rubber tubing.

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## TESTS WITH COPPER IN THE HOME LABORATORY

(Continued from page 51)

such a solution. Through the stopper of a wide-mouthed bottle or jar, insert a length of large glass tubing; a section cut from a broken test tube will do. Arrange a strip of copper to encircle the tubing and connect the copper strip to the negative side of a storage battery or a battery of dry cells. Place a carbon rod, taken from a flash-light cell, inside the glass tube and connect it to the positive terminal of the battery. Then fill the bottle with a solution of copper sulphate which should be slightly acidified with one or two drops of sulphuric acid. Electric current will begin to flow between the electrodes immersed in the liquid. In a few minutes you will notice that the liquid around the copper strip is growing paler. Soon it will have lost its blue color completely, and will be water-white. The reason for the loss of color is that the metallic copper ions in the vicinity of the copper electrode have been drawn to it and have turned into atoms of metallic copper, leaving the solution and plating out as more or less spongy mass of copper upon the strip.

COPPER resembles silver in that it is an excellent conductor of heat. A striking way to demonstrate this is to boil water with heat transmitted by a long piece of copper. Obtain a copper tube about a foot long, with an inside diameter of one eighth to one quarter of an inch, and slit one end with a hacksaw blade to a depth of about one inch. Flare out the slit end by hammering nails into it, so that it will serve as a receptacle for the tapered end of a glass tube holding the water. The latter should be about three or four inches long. The end taper is produced by holding the glass tube in the Bunsen flame and drawing it out, subsequently removing the excess glass. Put the end back in the flame to make sure it is closed. When the glass tube has cooled, it is filled with water and placed in the flared end of the copper tube, now supported by means of a clamp and an insulating grip made from a cork.

Now apply the flame of your burner to the end of the copper tubing farthest from the water. The heat will travel along the copper, and soon the water in the glass tube will be boiling merrily. Steam forming in the base of the tube will tend to push the water away from the heat, but this may be avoided by dropping an inch-long fragment of copper wire into the glass tube to distribute the heat through the water. The heat that boils the water is actually transmitted through the solid copper, and not by currents of heated air within the tube, as you can prove, if you wish, by stopping up the tube with a plug of clay.

CRYSTALS of copper are an unusual sight to most people, but they are easily produced with the simplest of apparatus. Make two solutions of copper nitrate, one strong and the other weak, adding a drop of nitric acid to the latter. Place an equal amount of each of the two solutions in a test tube. The strong solution should occupy the lower half of the tube and the weak solution the upper half, care being taken that they do not mix. Close the test tube with a cork that carries a piece of copper wire long enough so that it passes into both solutions, and set the tube away to stand. Within several days you will notice sharply faceted crystals of shiny, metallic copper forming on the lower part of the copper wire. What you have made is a sort of short-circuited electric battery, known as a concentration cell, which deposits copper upon the wire so long as there is a difference between the concentration of the two solutions. Eventually they become equalized in strength, and the action stops. The copper crystals may be removed and washed.



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## MEET THE CHAMPION INVENTORS

(Continued from page 13)

for wireless telegraphy, Dodds was assigned to help him. Many of the comforts incorporated in the modern Pullman car are there because Dodds invented them. Other examples plucked at random from his varied assortment of inventions include a "cold-light" emergency lamp for miners, and the portable, electric circular handsaw commonly used by carpenters and cabinetmakers.

Edward Weston, of Montclair, N. J., a fellow-townsmen of Carleton Ellis, concludes the roster of the eight leading inventors, with 309 patents. His work, like that of Thomson, has been concentrated in the field of electricity. Electrical men should have no difficulty in recognizing his name, for it appears upon electric measuring instruments that are used today in all parts of the globe.

**H**OW do the eight men whose achievements have been examined compare in productivity with inventors of the past? Only Edison, with his 1,099 patents, surpasses the living champion, but Patent Office records reveal other inventors, no longer living, whose attainments are nearly as impressive. Francis H. Richards, who required the services of ten draftsmen to put his ideas regarding weighing and packaging apparatus on paper, patented 850 inventions. Charles E. Scribner, Western Electric Company electrical engineer and inventor of telephone switchboards, took out 429 patents. Dr. Isadore Kitzee, a physician with whom inventing was a hobby, obtained 385 patents covering such varied subjects as telephone apparatus, railway signals, color photography, and radio; he described the latter, in 1895, as "space telegraphy." Dr. Elmer Sperry, inventor of gyroscopes and airplane instruments, amassed a total of 378 patents. Reuben B. Benjamin patented 359 electrical inventions. George Westinghouse, famous inventor of the locomotive air brake that bears his name and of other railway apparatus, is credited with 340 patents. Vincent G. Apple was granted 331 patents on automobile brakes, starting mechanism, and electrical devices.

Such figures are the more surprising when it is realized that a single invention made many inventors famous—Morse's telegraph, McCormick's reaping machine, Fulton's steamboat, and Eli Whitney's cotton gin. The Wright brothers, first to produce a successful flying machine, received a total of only five patents. Alexander Graham Bell, inventor of the telephone, obtained only twenty-four patents in all; and Marconi, father of radio, is credited with only thirty-eight inventions.

**J**UST forty years ago, the Commissioner of Patents published an "honorable roll" of inventors who had patented as many as 100 inventions. There were twenty-five names on that list. An honor roll of living inventors who have patented at least 100 inventions would now run into the hundreds. Its names would include Henry Ford, of auto fame; Lee De Forest, radio pioneer; Miller Reese Hutchison, once Edison's chief engineer and now an inventor in his own right; Nicola Tesla, electrical wizard; and hosts of others. The staff of the Westinghouse Electrical and Manufacturing Company, to take just one great industrial organization, includes six men eligible for such a roll. In fact, today one can easily list an honor roll of twenty-five inventors, each of whom has patented 100 inventions during the last five years!

The eight living leaders of American invention all have more than 300 patents. Turning to those in the class between 200 and 300 inventions, we find the contestants closely bunched. Erastus E. Winkley, of Lynn, Mass., heads the group; his 285 patents most-

ly relate to shoemaking machinery, but he also has a patent on an "equilibrator" for a flying machine, and one on an appliance used in playing golf.

One or more inventors may be selected for this 200-300 group from the research staff of nearly every one of the large corporations. Rudolf E. Hellmuth, of the Westinghouse Electric and Manufacturing Company, has 267 patented inventions. The General Electric Company may be represented by Ernst F. W. Alexanderson, with 258 patents. The Budd Car Company, of Philadelphia, presents a railroad man, Joseph V. Ledwinka, who now holds 252 patents, and who also recently had the distinction of being awarded the 2,000,000th patent issued by the U. S. Patent Office (P. S. M., July, '35, p. 11). The B. F. Goodrich Company, of Akron, Ohio, offers John R. Gammeter, with 245 patents; he is tied with Jesse A. B. Smith of the Underwood typewriter organization.

**I**N ALL gallantry, honorable mention must be given to Miss Beulah Louise Henry, of New York City, who has received the sobriquet of "Lady Edison" for her many household inventions. Though her total of fifty patents may seem small compared with those of male inventors, they loom large in comparison with those of others of her sex. Less than two percent of the patents issued by the U. S. Patent Office have been granted to women—a proportion that has remained practically constant from year to year, since the turn of the century. For the present, at least, invention seems a man's field.

Will present records—like O'Connor's or Edison's—ever be broken by other inventors? Perhaps not. One man no longer has a field to explore alone. Huge research laboratories are the order of the day. Under this tendency toward group or organized invention, with keen, competitive workers sharing assigned inventive tasks, the chances of one inventor forging ahead of the rest appear slight.

Nevertheless, it must be pointed out that every one of the inventions of O'Connor, who leads all living inventors, was a one-man job—making his achievement all the greater in comparison with others who have large laboratories and staffs of assistants to help them do their inventing. His example offers encouragement to the belief that some independent inventor, working on his own, may yet outdo the leading figures of the present and past.

## THE ORIGIN OF COOKING IS UNSOLVED MYSTERY

**W**HY man ever acquired the troublesome habit of cooking his food remains a mystery to scientists, according to a British authority. Earliest traces of prehistoric men show that they cooked their meals but the only scientific reason for doing it—to kill germs and other parasites—was unknown to them. Cooking could not have originated as an aid to digestion, since raw foods digest as well as cooked ones. The theory that the purpose of cooking was to improve the taste of food is countered by the argument that this is only a matter of habit—that most persons today, for example, prefer the flavor of cooked food simply because they are used to it. One possible explanation is that primitive cookery began as a religious ceremony, such as presenting burnt offerings to the gods. Another, more plausible, is that the aroma of a meal being cooked appealed as much to primitive senses as to our own. Whatever the origin of cooking, it has probably absorbed more human effort and time, down through the ages, than any other single task.



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## AMAZING NEW FEATS OF MOTORLESS PLANES

(Continued from page 36)

sport. Recently, the Elmira Chamber of Commerce, through the aid of Federal funds, has established four permanent soaring sites on ridges near-by. Facing in different directions, they enable pilots to get into the air no matter from what direction the wind may blow.

Site Number One is known as Henry Harris Hill. It has a cleared space 1,650 feet long and 200 feet wide and holds the headquarters buildings, the radio equipment and the meteorological apparatus. Last year, airplanes landed and took off from this site during the meet. The ridge faces the Chemung River valley and is approximately 1,690 feet above sea level. It provides soaring when the prevailing northwest winds are blowing.

THE second site faces the west, is 1,600 feet above sea level and has a take-off field 600 feet long and 200 feet wide. It is known on the topographic maps as Maby Ridge. Quarry "Quarry" where Mark Twain once lived and where he did much of his writing. Site Number Three is five miles out from Elmira on a 1,500-foot ridge facing across a valley toward the American Airlines airport where soaring ships have 100 acres on which to land. The fourth site is eight miles out and faces the south. The ridge is 1,600 feet above sea level and has a launching field 750 feet long and 300 feet wide.

With improved roads leading to the take-off spots, this Chemung County "soaring plant" is one of the finest in the world. Another noted spot is at Big Meadows in the Shenandoah National Park, Va. The Soaring Society of America has held several meets there. Last Spring, Lewin B. Barringer, of Philadelphia, tried out a new site near Ellenville, N. Y. Taking off in the "Albatross II," he remained aloft seven hours, rose to 5,000 feet, and sailed down the ridges to within ten miles of Harrisburg, Pa., before the updrafts gave out and he had to land. He had covered approximately 160 miles and was credited with beating Du Pont's record, made the year before in the same machine.

On the west coast, Clyde Artman has been using a 1,000-foot cliff for a starting spot. His soaring plane is placed on a sort of seawall which is tipped up until the craft is pointing down over the edge of the cliff and Artman shoots downward in a dangerous, spine-tling take-off. Sometimes, he dives as much as 500 feet before he eases back the stick and soars away.

Recently, the value of gliding in training air pilots received special recognition. At the U. S. Naval Air Station, at Pensacola, Fla., four officers who had had no training on powered ships, but had been given glider training instead, were able to keep up with a class that had had ten hours dual instruction and two hours solo work before coming to Florida.

SO IMPRESSED were naval air officials that six Franklin utility gliders are now in use on the base. One half the men are starting their training on gliders, the other half on powered planes. Comparative results are expected to answer such important questions as: Does glider training make better pilots? Does it save time in training pilots? Does it reduce the cost at an air school?

In Germany, 40,000 glider pilots have been trained with less than half a dozen fatal accidents. In the United States, gliding reached a peak in 1930 and then, largely because of the depression, lost ground. Now, flying without motors has come to the fore again, providing valuable training for air pilots, a sky laboratory for aeronautical engineers, and a thrilling sport for amateurs.



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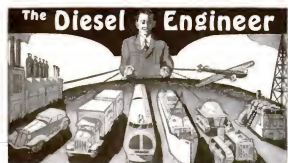
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### HERE'S THE ANSWER

(Continued from page 55)

ancestors had to trample down a sheltered and safe bed for themselves in the open and this, it is reasoned, would entail a turning motion.

### Up Where It's Really Hot

B. I. H., EVANSVILLE, IND. The average temperature of the sun is estimated to be 12,000,000 degrees C. by Sir Arthur S. Eddington, British astronomer-physicist. The maximum temperature, he calculates is 21,000,000 degrees C.

### Keeping Food in Open Cans

Q—Is it safe to let food remain in a can after it has been opened?—S. D. S., Houston, Tex.

A—TESTS have shown that food keeps perfectly well in an open can provided the proper storing precautions are observed, principally that of good refrigeration.

### An Indian Count

C. B. E., TULSA, OKLA. According to the 1930 census, there were 332,397 American Indians in the United States. Oklahoma has the largest Indian population with a total of 92,725. After the Civil War, in 1865, the Indian population was estimated at 294,574.

### The Pig in Pig Iron

A. I. S., KENOSHA, WIS. Pig iron gets its name because the trench and side channels into which the molten iron is run from the smelting furnace suggest a sow with rows of suckling pigs. The pig iron is formed in the side channels. The forms, collectively, are referred to as the pig bed.

### Sweetening a Vacuum Bottle

Q—How can I remove an odor of staleness from a vacuum bottle?—M. J. C., Elizabeth, N. J.

A—A MEDIUM strength of which is usually effective is to wash the bottle with a solution made of powdered black mustard seed in lukewarm water. The washing process should be repeated if necessary and the bottle rinsed thoroughly after each washing.

### Aluminum Found Not Guilty

Q—I HAVE heard that there is danger of poisoning from the continued use of aluminum cooking utensils. Can you tell me if this is so?—A. M., Toledo, Ohio.

A—ALUMINUM cooking utensils are not a source of poisoning according to a recent report of two French scientists to the Paris Academy of Sciences. They found, after extensive experiments with rabbits, that the daily ingestion of small quantities of aluminum is not harmful. This finding corroborates the conclusion of earlier American investigators.

### Oil Spots Leave Wall Paper

Q—IS THERE any method by which oil stains can be removed from wall paper?—D. M., Houston, Texas.

A—A MEDIUM thick paste made of clay (such as is used in making water pipe) and water applied carefully to the stain will remove most oil spots from wall paper. Care must be taken that no friction is caused in applying the paste. The paste should be allowed to remain in position for ten to twelve hours. After this time it should be removed very carefully with a soft cloth. It may be necessary to repeat the process. If the paper is very thin, a paste made of magnesina and benzine may be substituted and the procedure is the same.



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# MYSTERIOUS DISEASES THAT BAFFLE MEDICAL SCIENCE

(Continued from page 27)

Angeles, Calif., recently added other prize oddities to the wonderland of queer cases. In Devonshire, an innkeeper had a heart that whistled with 'every beat. Two leaves of a defective valve between chambers had stuck together. They formed a funnel-shaped opening through which the blood rushed with a whistling sound as it was pumped into the arteries. Oftentimes, the whistle was loud enough to attract the attention of people passing by. It preyed upon the man's mind until, in the end, he committed suicide.

**H**ARTFORD'S medical curiosity is a man with ticking ears. They give off between 100 and 132 clicks a minute, and people sitting several feet away can hear the sound. Dr. Henry F. Stoll, who reported the case to the American Medical Association, discovered the secret of the mystery. By inserting periscopic instruments in the man's throat and neck, he traced the curious clicks to a tiny muscle lying along the wall of the Eustachian tube, the open channel connecting the throat and the middle ear. A nervous disorder produced rhythmic twitchings of this muscle. Each time it contracted, it opened the mouth of the Eustachian tube and produced a click. As it relaxed, the tube closed noiselessly.

Recent photographs from Los Angeles, Calif., show a youngster who takes after his father on one side of his head and after his mother on the other. Red hair grows on the right side, light blond hair on the left. His mother is red-headed, his father blond. In addition, the boy's right eye is brown while his left eye is blue and his complexion is darker on the right side than on the left.

Bones that are out of place, bones that are too brittle, bones that are too thick, bones that are attacked by rare and puzzling diseases—are a constant source of extraordinary cases. One instance of the sort is "Brittle-Boned Billy," a Bellaire, Ohio, boy who has the unenviable record of sixty-four major fractures. Almost every time he falls down, he breaks a bone. Another instance is a woman patient who broke three bones turning over in bed. During a single month, she averaged a broken bone a day. A disease, called osteomalacia, had robbed her bones of their supporting lime and had reduced them to mere shells.

At the opposite extreme are the cases where the calcium factories of the body get beyond control, depositing the bone material not only where it belongs, but in the tissues of the body as well. Muscles literally turn to stone, and patients become living statues. From San Francisco and Los Angeles, Calif., Wilkes-Barre, Pa., and Columbus, Ohio, have come recent reports of victims of the rare disease.

The most dramatic of the cases is that of a woman in San Francisco, Calif. X rays showed that a shell of bone was incasing her heart and, unless removed, would cause her death. At Mount Zion Hospital, surgeons successfully operated upon her and succeeded in removing a large part of the ossified tissue.

**T**HE cause of such surplus calcium is still a mystery. Many scientists believe the four little parathyroid glands, located in the neck, are responsible. They govern the deposit of calcium carbonate in the bones. The theory is that some upset in these glands floods the system with the bone-building material and causes the trouble.

Akin to such disorders is Paget's disease, a mysterious malady of the parathyroid glands. The head expands enormously, the torso shortens, the legs are bowed and the victim takes on an appearance that suggests that of an ape. The most recent case occurred in California. A forty-nine-year-old artist was stricken eight years ago. Since then his head

has grown to three times normal size and his body has shrunk until he is ten inches shorter than he was.

Another strange medical case which has attracted world-wide attention is that of Patricia Maguire of Oak Park, Ill. For more than 1,000,000 minutes, she has been sleeping steadily. In February, 1932, she began feeling drowsy and shortly afterwards fell into the deep sleep from which she has not awakened. Blood transfusions, drug injections, artificial fevers, and special vaccines have been used in an effort to arouse her. Her color is good and she has the appearance of a well person doing. Doctors believe her long sleep is ending.

**A**HUNDRED miles away from Oak Park, at Roundgrove, Ill., a woman who couldn't stop yawning recently kept physicians nonplussed for more than a week. At four o'clock one Sunday afternoon, Mrs. Harold McKee began to yawn. From then on, hour after hour and day after day, she continued to yawn from eight to twelve times a minute. Finally, the yawning marathon ended and the exhausted woman fell into a natural sleep. What caused the perplexing disorder is still a mystery. Some medical men suggest it was a mild case of sleeping sickness.

A commoner form of attack is continued hiccupping. For some unexplained reason, during 1920, an epidemic of hiccupping swept over Paris, France.

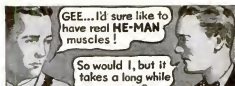
Undoubtedly the world's queerest hiccup story recently came from Hanford, Calif. Worn out by an attack of hiccupping that lasted for days, a bootblack tried to commit suicide by holding a revolver to his head. Just as he pressed the trigger, a hiccup jerked the muzzle into the air, spoiled his aim and saved his life!

In Nova Scotia, not long ago, a delicate nerve operation ended what probably is the long-distance hiccupping record for all time. Thin and weak from a five-year siege, a Newfoundland woman was brought to the hospital on a stretcher. In the operating room, surgeons exposed and treated the phrenic nerve which runs down the neck and controls the diaphragm muscles. Immediately, the spasmodic contractions of the diaphragm ceased.

**T**HE final case in this oddity list is one of the queerest of all. Some years ago, a man came to me with bad burns between the first and second fingers. He told me he had been sitting talking to a friend and smoking a cigarette when both of them smelled singed flesh. He looked down and discovered the cigarette had burned his fingers without producing the slightest sensation of pain. I stroked his hand with a light camel's-hair brush. He detected the touch instantly. But when I applied heat or cold, he felt nothing.

In every square inch of skin on the back of a human hand there are approximately fifteen "cold spots" and nine "hot spots." Some are as large as a pinhead. Nerves crossing within the spinal column, carry sensations of heat and cold from these receptor points to the brain. An examination revealed what had happened in the case of the patient. A cavity, forming down the center of the spinal column, had destroyed the nerves that carried temperature sensations. Those carrying touch sensations ran up the sides of the column and were unaffected. Thus, the man could feel a fly land on the back of his hand but couldn't tell the difference between hot water and ice.

In recent years, the X ray and other aids to diagnosis have helped physicians learn much about the mystery maladies they meet. But of queer diseases still form an often unexplained, frequently bewildering, and always fascinating sector in the field of medicine.



—says  
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## RADIO BURGLAR ALARM FROM RECEIVER PARTS

(Continued from page 53)



Connecting wires leading from the cabinet. The outfit operates on 110-volt house current

power lines or, on finding the control circuit, removes the power plug from the wall socket.

Although the alarm can be turned on and shut off simply by inserting or removing the power plug and connecting or disconnecting the bell, control switches installed in the power-cord lead and alarm-bell circuit will make it easier to shut the system off during the day and turn it on at night.

Because of its novelty, the circuit can be put to many other uses. For instance, it can be used to turn on the lights when you enter your front hall. It can be rigged to open doors, operate drinking fountains, indicate rain, operate toys and window displays, and do a score of other things. Of course, where 110 volts are used in the circuit being controlled, a relay rated to carry that amount of current must be used.

### LIST OF PARTS

- C<sub>1</sub> and C<sub>2</sub>—Variable condensers, 325 mmf.
- C<sub>3</sub>—Fixed mica condenser, .0001 mfd.
- C<sub>4</sub>—Fixed paper condenser, .06 mfd.
- C<sub>5</sub>—Fixed paper condenser, .5 mfd.
- R<sub>1</sub>—Fixed resistor, 10,000 ohm.
- R. F. C.—Radio-frequency choke, 85 mh.

Miscellaneous: Two six-prong, 160-meter plug-in coils; two six-hole sockets; one five-prong socket; one power cord with built-in resistor (345 ohm); type 76 tube; one battery and gong or bell for external alarm circuit; one sensitive relay; wire; solder; chassis; panel; knobs; etc.

## ACETYLENE GENERATORS YIELD USEFUL RESIDUE

THE waste product of acetylene generators has many everyday uses. This carbide residue, it is stated by a prominent manufacturer, can be used as the principal ingredient in white-wash, fire-proof cement, mortar, concrete, or stucco. It is efficient as an oil or dirt scavenger, a cleaner of drain pipes, plant spray, preserver for wooden fence posts, and deodorizer for farm buildings. Its superiority in so many uses, it is claimed, is due to its chemical purity and its complete hydration.

## RUSSIAN RAIN PLANT SPRAYS LARGE AREA

WHENEVER certain farms in the Rubtsovla district of Russia need rain, they will get it by the simple act of turning on a rain plant. The plant sprays artificial rain over a tract of 500 acres.

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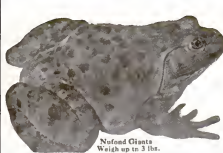
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## GUS GIVES POINTERS ON WINTER FUEL TROUBLES

(Continued from page 56)

so stiff that it holds the pump when you try to wiggle it to see if it's loose. You can see the pump jiggling when the motor is running. Naturally, when the motor stops the jiggle stops, too. So, by the time you get out to look at it, there's nothing wrong to see!"

"That would have stumped me, sure enough," Carnaday agreed. "But it's easy to see how to prevent that trouble from stopping you on the road. Keep these bolts tight." He got out a wrench and tightened them while Gus cut a new piece of copper tubing.

"WELL," Carnaday went on, as Gus bent the new piece into shape, "modern cars bring modern troubles. It didn't make any difference, in the old days, whether the vacuum tank was hanging on by its eyelids or not, it still worked just the same."

"Yeah, but think of all the troubles the vacuum tank had that you can't have now," Gus suggested. "Besides, there's plenty of troubles with gas lines that we'll always have with us. As an old-timer, you ought to know a lot of 'em."

"I should say I do!" Carnaday grinned reminiscently, as he held one end of the pipe while Gus bent the other so it entered the fitting straight. "I guess as long as there's pipes there'll be trouble to clog them. Of course the gasoline is a lot cleaner now than it used to be. Some water in it now and then, but that don't amount to anything."

"Maybe it doesn't down South where you come from," Gus grunted, "but believe me, it can put your motor out of commission quick enough up here where we have real winter weather. Lots of car owners have tried to start their cars on a real nippy cold morning and found they wouldn't start at all. Mostly, they blame it on bad gas or poor ignition or a bum battery, when in fact it's just the water frozen in the gas pipe or in the carburetor jets."

"While you're putting in this new pipe, why not put in an extra filter to take out the water? I keep my car in an unheated garage, too," Carnaday suggested.

"One filter is just as good as a dozen," Gus explained. "How is any filter going to keep water from freezing in the line between the tank and the fuel pump—unless you put it right at the outlet of the tank? And even filtering the gas before it goes in the tank won't keep water out of the tank. It condenses out of the air that is drawn in as the gas is used."

"LOOK how those windows are covered with moisture," Gus went on, pointing to the nearest glass, which was covered with a film of water in tiny globules. "That always happens when it turns cold right after a warm, muggy spell. Suppose you pull into your garage some warm night and the tank is nearly empty so there's a lot of air in it; then, during the night, it gets real cold. The inside surfaces of the tank get dripping wet, just like that window, and maybe as much as a tablespoonful of water settles to the bottom all ready to get into the pipe and freeze there."

"Gosh!" exclaimed Carnaday. "There doesn't seem to be any way to get around that."

"You can't," Gus agreed, "but you can stop the chance for freeze-up just the same. All you need to do is drop a tablespoonful of denatured alcohol into the tank every few days, and especially after a sudden change to cold weather. If there isn't enough water to cause any trouble, the alcohol will do no harm anyhow. If there is, it will mix with it and keep it from freezing."

"That sounds like a good idea," Carnaday observed, as Gus (Continued on page 117)



This One



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## GUS GIVES POINTERS ON WINTER FUEL TROUBLES

(Continued from page 110)

finished installing the new pipe, "and I'm sure going to try it this winter. But what I want to know is, how do you get a car started when there's water frozen in the gasoline line somewhere?"

"Best way I know is to pour hot water over the carburetor—but be sure it doesn't get in the air intake. Pour some more over the pump and the pipe leading to it, as well as the pipe leading back to the main tank as far as you can get at it. Heating the carburetor that way is old stuff, of course, it's always been a good way to make starting easy in real cold weather."

"What if the ice is farther back in the pipe near the tank?" Carnaday asked.

"In that case," Gus suggested, "about the only thing to do is to crawl under and thaw the pipe with rags dipped in hot water. You'll only have to work on the low spots in the pipe, because the water settles there."

"THANKS for the dope, Gus," Carnaday said, as he stepped on the starter while the mechanic watched to see if any signs of a leak appeared in the joints of the new pipe when the fuel pump began to force gas to the carburetor. "Guess you've covered all the things that are likely to keep gas from flowing, all right."

"Except two," grunted Gus, running his finger around under each joint to make doubly sure there was no leak.

"Two more?" Carnaday questioned. "What are they?"

"One is a frozen air vent to the tank," Gus replied. "Sleet, or even mud, can gather around the filler cap so tight that it closes the tank that lets air into the tank and then you're sure to stop. If the vent is a separate standpipe, moisture can collect in it and freeze, and the result will be the same."

"I hadn't thought of that," Carnaday admitted. "And what's the other?"

Gus smiled. "The most common trouble of all when the motor stops for lack of gas—and one that can fool even the expert, because he may not think to look for it—is an empty gasoline tank!"

## USE OXYGEN INJECTION TO REPLACE BREATHING

STAYING alive without breathing is a startling possibility suggested by recent experiments in England. In one test, a dog survived a two-hour exposure in an artificial atmosphere devoid of oxygen, its life being preserved by injecting a stream of small oxygen bubbles through a hypodermic needle into an artery in the leg. The blood of the living animal was oxygenated or refreshed by direct contact with the oxygen, just as it normally would be by indirect contact with oxygen of the air through the membranes of the lungs. Further tests are expected to show whether injection of oxygen into the human blood would be of benefit in reviving persons near death from drowning, and in treating sufferers from lung diseases.

## PROCESS SETS CONCRETE IN TWENTY MINUTES

A CONCRETE which sets so quickly that a man can walk on it without leaving a trace twenty minutes after it is laid has recently been demonstrated. The concrete mixtures in general use require a far greater amount of water to obtain the necessary plasticity than is needed for the water's chemical effect of hydrating alone. Recognizing this fact, states the inventor, he has devised a simple and inexpensive process of removing the excess water quickly.

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RUSH THIS COUPON TO

# Skyscrapers Torn Down from the Ground Up

(Continued from page 15)

of "mopping up" by the power shovel.

Equipment and methods have to be varied to fit each job. When the company razed 200 buildings on the three-block space now occupied by Rockefeller Center, one of the simplest of the builder's or excavator's devices was used—in reverse. After the roof of an old, five-story dwelling had been removed, workmen on the top floor began to shore up one of the outer walls, from the inside, just as a tunnel is shored. Long timbers, leaning against the upper part of the wall, were braced at the bottom of the opposite wall. Barmen walked up the inclined planks and pried them lower and lower, as if they were propping up the outer walls more tightly. The walls bent outward and fell, a whole story at a time.

A DIFFERENT plan was used in the demolition of the "Spanish Flats," a few years ago. An area of about 80,000 square feet was occupied by ten- and sixteen-story buildings, with thick, substantial walls which gave unusually stubborn resistance to the barmen. The difficulty was met by cutting vertical slots into the walls. The effect was to divide them, at the top story, into huge piers. At the foot of each pier, a two-foot hole was cut. One end of a twenty-four-inch I beam, lifted by a derrick, was guided into the hole. Then the derrick pulled up on the other end of the beam—and over went the pier! The contractors had converted the derrick into a mechanical barman, wielding a 2,500-pound bar.

The regular bar, which practically all New York wreckers now use in preference to the adz and pickax, owes its original design to the Volk Company—and to a demand for firewood.

When Albert Volk first entered the wrecking business, other wrecking contractors were salvaging floorboards. Workmen used bars with wide, flat edges, and short "heels," or bent-up ends. Starting at the proper side of a floor, they lifted out each board carefully so as not to damage the board.

"We adopted new bars, with sharp, narrow points, and much longer heels," says Volk. "Workmen could easily jab the into any convenient parts of a floor, and rip it out swiftly. The boards were splintered, but we sold them for firewood. Of course, the difference in value was much less than what we saved in labor costs, as well as in the property owner's time.

"Another practice, years ago, was to put all bricks into baskets and lower them gently to the ground, to be cleaned and sold. One of our foremen devised a wooden chute. It didn't carry the bricks quite so gently, but it saved expenses. It was adopted throughout the industry."

Changing values always are vital factors in the wrecking industry. Its methods must conform to the balance between the salvage market on the one side, and labor costs and the value of speed on the other. Speed grows more important as land values increase; the more a piece of ground is worth, the more its owner loses while it is idle.

WHEN the Volk company began operations, wrecking contractors were paying for the privilege of demolishing buildings, and making their profits from salvage. The Volk company began to offer property owners less money and more speed.

Other contractors were saving sash weights, door knobs and even screws. Doors were taken down in perfect condition, and the jambs were carefully cut out. The Volk workers ripped the doors off, and even unscrewed the hinges, and sold them at half price.

They splintered the jambs for firewood. They smashed window panes instead of removing them. Their first wrecking job, on two five-story brownstone houses, was finished in two weeks instead of the customary four.

Twenty-six years later, in 1929, the Volk company's men were smashing modern bathtubs and dumping them with the other rubbish, instead of hoisting them down to be sold secondhand.

The more valuable and easily handled objects, such as chandeliers, mantels, and mirrors, however, always have been removed before demolition.

SECONDHAND structural steel has almost always been disposed of profitably. Even wood has had its occasional day. During the World War, when new lumber was imperfectly seasoned, the builder of one of New York's most fashionable apartment houses insisted on secondhand timbers for much of the construction. Today a large part of the salvaged lumber goes to bakers with wood-burning ovens.

The really vast changes in salvaging operations, since the days when wreckers paid for the right to dismantle houses, was strikingly illustrated at the demolition of the famous old Waldorf-Astoria Hotel. At its last appraisal, that building was worth five million dollars. When a contracting firm tore it down, the cost was \$900,000, and all the salvaged materials brought only \$150,000!

One of the most curious of all salvage jobs occurred when the Volk company demolished

the old United States Assay Office, in Wall Street. Sweepings and other debris—including even chimney soot—were "smelted," and yielded \$10,000 worth of gold—more to the ton than many a gold mine.

Instead of destroying the beautiful façade of that 100-year-old structure, the wreckers took down the stones carefully and numbered each one, according to position. They were put together again as the façade of a wing of the Metropolitan Museum of Art.

By a similar procedure, many entire buildings have been transplanted to new locations. For instance, the old Hotel Savoy was shipped from New York to Havana, in pieces. But the usual disposition of demolished structures is different.

Most of a twenty-five-story, 325-foot-high office building—the tallest ever demolished—lies at the bottom of the Atlantic Ocean. The Volk company hauled the debris to barges which carried it out to sea. There, too, lie the old Waldorf-Astoria, and at least two other renowned hotels, besides countless lesser buildings.

AUTOMOBILES traversing New York City's West Side Highway will pass over the old Criterion and Century theaters, and the Majestic hotel. Their masonry remains were used in making a fill.

The 200 buildings cleared from the Rockefeller Center site, and the ancient slums razed to make way for the modern residential development known as Knickerbocker Village, rest close together on Long Island, helping to convert a swamp into solid ground which will later be the foundation for still other dwellings.

An office building in the New York financial district had a steel frame and masonry walls from four to ten feet thick. The wreckers tried to split up the massive stones by drilling holes, filling them with water, and freezing the water with dry ice. It was only partly successful. They tried pneumatic pressure, using oxygen compressed in tanks. Experiments with hydraulic force indicated that more complete equipment of that sort might be effective on future jobs. But the fortresslike walls finally were wrecked by a standard mechanical method, the "plug and feather" system. Holes were drilled at intervals, and wedges were pounded in until the stones split.

Similar tactics were used on the old Standard Oil building, not far away. The 250-foot tower had stones as heavy as nineteen tons, which had to be broken and lowered to the street. Altogether, 1,000 tons of rock were taken from the walls.

THE most serious difficulty ever met by the Volk company was when they used the upside-down system for the first time on a really tall structure. It was a twenty-four-story office building, 250 feet high. It was a narrow building, and the debris piled up all the way to the fifth floor! That situation was a new one.

Across a narrow street was the New York Stock Exchange. The wreckers were afraid if the power shovel cut too much of a hole in the brimful walls, the rubbish would pour out and "flood" the exchange, or other nearby buildings.

The shovel made a cautious start, and nothing happened. It made a wider opening in the walls, and bit more deeply into the pile, but still nothing happened. The debris was packed down so hard it couldn't fall out. The tightness of the heap made excavating slower than usual, but still it was speedier than the old method.

And speed, next to safety, is the chief measure of success in wrecking.

## Derricks Help Make History



SOVIET engineers recently faced a strange problem in removing the huge metal two-headed eagles, symbols of the czarist regime, from the towers of the Kremlin in Moscow. Cranes, mounted on a suspended steel structure, lowered the shields as shown in the photograph above.



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